

**B.L.D.E.A's V.P.Dr.P.G.HALAKATTI COLLEGE OF ENGINEERING AND
TECHNOLOGY VIJYAPUR 586103**

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CBCS SCHEME

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15CV833

Eighth Semester B.E. Degree Examination, Dec.2023/Jan.2024 Pavement Design

Time: 3 hrs.

Max. Marks: 80

- Note:** 1. Answer any FIVE full questions, choosing ONE full question from each module.
 2. Missing data, if any may be assumed.
 3. Use of relevant charts is permitted.

Module-1

- 1 a. Draw neat sketch of cross section of a flexible pavement and describe the functions of each layer. (08 Marks)
- b. Determine the deflection values under a wheel load of 60kN and contact pressure 0.7 N/mm² in a homogeneous mass of soil at a depth of $Z = 2.5a$ upto a radial distance of $r = 5a$. Take modulus of elasticity of subgrade as 8 N/mm². Sketch the deflection curve. Use Fig.Q.1(b). (08 Marks)

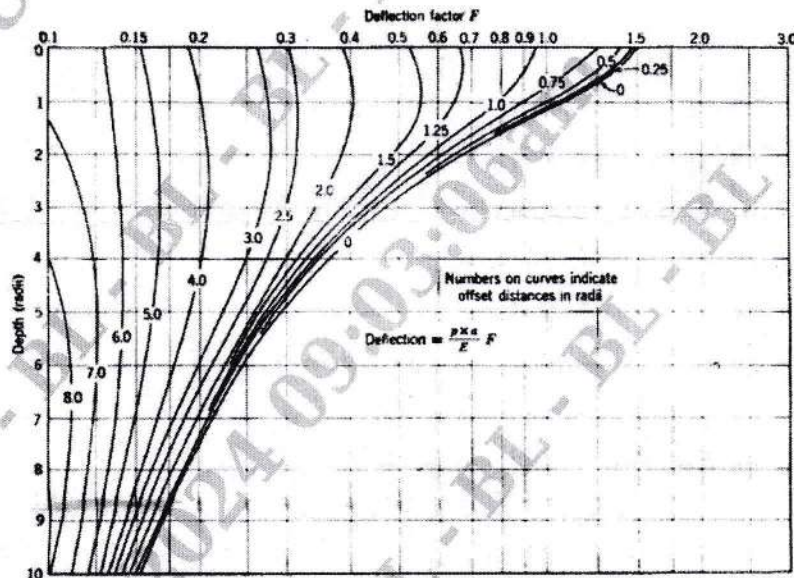


Fig.Q.1(b)

OR

- 2 a. Compare the salient features of flexible and rigid pavements. (08 Marks)
- b. A plate load test was carried out on subgrade using 300mm diameter plate and corresponding to a deflection of 5mm, the load sustained on the plate per unit area was 0.08 N/mm². The test was repeated on base course of thickness 300mm and unit load sustained was 0.45 N/mm² at the same deflection. Find:
 - i) Elastic modulus of subgrade and the ratio E_P/E_S .
 - ii) What should be the thickness of base course as to sustain wheel load of 50kN and contact pressure 0.6 N/mm² so that maximum deflection does not exceed 5mm. Use Fig.Q.2(b). (08 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
 2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

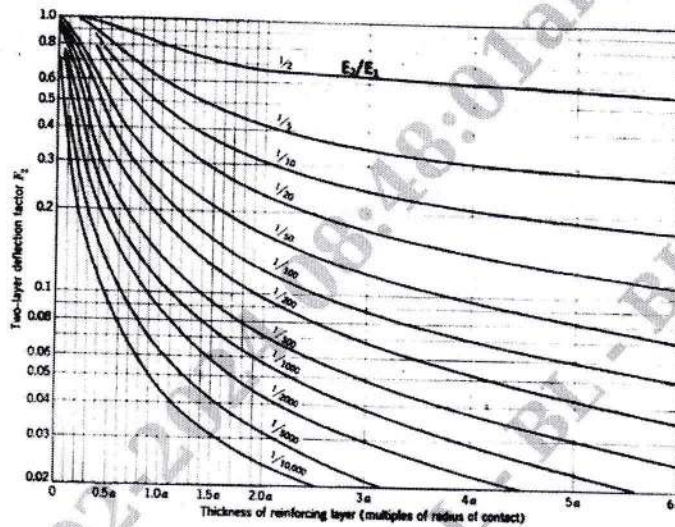


Fig.Q.2(b)

Module-2

- 3 a. With a sketch describe the significance of design wheel load and contact pressure in design of pavement. (04 Marks)
- b. Explain the concept of Equivalent Single Wheel Load (ESWL). (04 Marks)
- c. Calculate the design repetition for 20 years period for wheel load equivalent to 2268 kg wheel load using the following traffic survey data on a four lane road.

Wheel load (kg)	Average daily traffic ADT in both directions	% of total traffic volume
2268	Total volume 215 Considering traffic growth	13.17
2722		15.30
3175		11.76
3629		14.11
4082		6.21
4532		5.84

(08 Marks)

OR

- 4 a. Design a highway pavement using McLeod method of wheel load 6000 kg with tyre pressure of 6 kg/cm². The plate load test conducted on subgrade soil using 30 cm dia plate yield a pressure 2.8 kg/cm² after 10 load repetitions at 0.5 cm deflection. (08 Marks)
- b. In a dual wheel assembly the load on each wheel is 32 kN tyre pressure is 0.6 N/mm² and c/c wheel spacing 410 mm. The load is placed on a pavement 500 mm thick. The subgrade characterized by $E = 20 \text{ N/mm}^2$ and $\mu = 0.5$. Calculate the deflection on the top of subgrade at the radial distance of 0.15 and 250 from the centre of left wheel measured towards other wheel using deflection chart. (08 Marks)

Module-3

- 5 a. Explain different types of flexible pavement failure. (08 Marks)
- b. Explain the various design factors for runway pavement. (08 Marks)

OR

- 6 a. What are the causes of formation of waves and corrugations in flexible pavement? Suggest remedial measures. (08 Marks)
- b. Explain step by step procedure of conducting Benkleman beam-deflection studies for-evaluation of flexible pavement surface condition. (08 Marks)

Module-4

- 7 a. Explain:
- Radius of relative stiffness
 - Equivalent radius of resisting section
 - Critical load position
- (08 Marks)
- b. A cement concrete pavement of 25 cm thickness is constructed over a granular surface having modulus of reaction 10 kg/cm^3 . The maximum temperature different between the top and bottom of the slab during winter is found to be 15°C . The spacing between the transverse joint is 7.5 m. Find the worst combination of stresses at the edge and corner regions. (08 Marks)

OR

- 8 a. Write the step by step procedure for the design of concrete pavement as recommended by IRC 52.2002. (08 Marks)
- b. Design the size and spacing of dowel bar at the expansion joints of a cement concrete pavement of thickness 25 cm with radius of relative stiffness 80 cm. For a design wheel load of 5000 kg. Assume load capacity of the dowel system as 40% of the design wheel load joint width is 2 cm, permissible shear and flexural stress in the dowel bar are 1000 and 1400 kg/cm^2 and permissible bearing stresses in cement concrete is 100 kg/cm^2 diameter of dowel bar = 2.5 cm. (08 Marks)

Module-5

- 9 a. What are the factors considered in design of rigid pavements? Explain any three factors. (08 Marks)
- b. List the typical failures in rigid pavements and explain any three of them. (08 Marks)

OR

- 10 a. With sketches, describe the various types of joints and their requirements, in rigid pavements. (08 Marks)
- b. Determine spacing between contraction joints for a 3.5m slab width having thickness of 200mm, friction 1.5, for the following two conditions:
- Planche cement concrete, allowable $S_c = 0.08 \text{ N/mm}^2$
 - Reinforced cement concrete, 10mm diameter bars at 0.3m spacing. (08 Marks)

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Third Semester B.E. Degree Examination, Dec.2023/Jan.2024
Strength of Materials

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- 1 a. Derive the expression for elongation of tapering circular bar subjected to an axial tensile load P. (08 Marks)
- b. A circular bar of uniform cross sectional area of 1000 mm^2 is subjected to forces as shown in Fig.Q1(b). If Young's modulus of the material is 200 GPa, determine the total deformation.

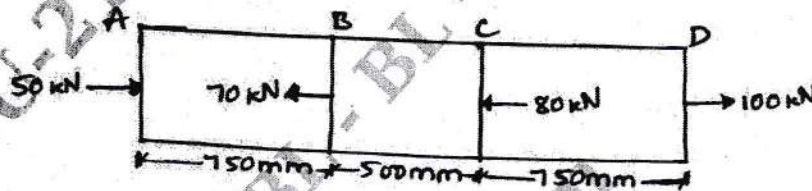


Fig.Q1(b)

(12 Marks)

OR

- 2 a. Derive relation between Young's modulus, Rigidity Modulus and Poisson's ratio. (08 Marks)
- b. A steel rod of 20mm diameter passes centrally through a copper tube of 50mm external diameter and 40mm internal diameter. The tube as closed at each end and the nuts are tightened on the projecting points of rod. If the temperature of assembly is raised by 50°C . Calculate the temperature stresses developed in copper and steel. Take $E_s = 200 \text{ GN/m}^2$, $E_c = 100 \text{ GN/m}^2$ and $\alpha_s = 12 \times 10^{-6} \text{ per } ^\circ\text{C}$ and $\alpha_c = 18 \times 10^{-6} \text{ per } ^\circ\text{C}$. (12 Marks)

Module-2

- 3 a. Define (i) Principal stress (ii) Principal plane. (04 Marks)
- b. Derive an expression for normal stress and tangential stress for a member subjected to uniaxial loading. (06 Marks)
- c. The stresses acting at a point in a two dimensional system is shown in Fig.Q3(c). Determine the principal stresses and planes, maximum shear stress and planes normal and shear stress on plane AB.

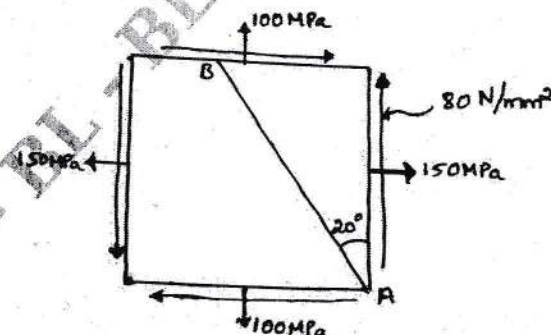


Fig.Q3(c)

(10 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
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OR

- 4 a. Differentiate between thin and thick cylinders. (04 Marks)
- b. A element is subjected to a tensile stress of 120 N/mm^2 on the vertical plane and another compressive stress of 80 N/mm^2 on the horizontal plane. Compute the normal and tangential stresses on a plane making an angle of 30° anticlockwise with the vertical plane. (06 Marks)
- c. A closed cylindrical steel vessel 8m long and 2m internal diameter is subjected to an internal pressure of 5 MPa with the thickness of vessel being 36mm. Compute hoop stress, longitudinal stress, maximum shear stress (10 Marks)

Module-3

- 5 a. Derive the relationship between load intensity, Shear force and Bending moment. (08 Marks)
- b. For the simply supported beam shown in Fig.Q5(b), draw SFD and BMD. Also find point of zero shear and its bending moment.

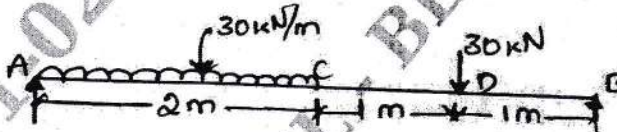


Fig.Q5(b)

(12 Marks)

OR

- 6 a. Sketch SFD and BMD for the beam shown in Fig.Q6(a), indicating salient points.

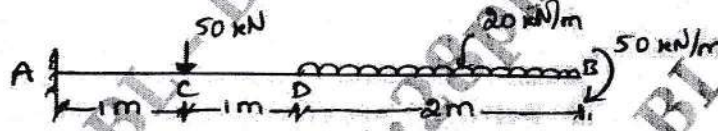


Fig.Q6(a)

(08 Marks)

- b. Sketch SFD and BMD for the beam shown in Fig.Q6(b), indicating salient points including point of contraflexure.

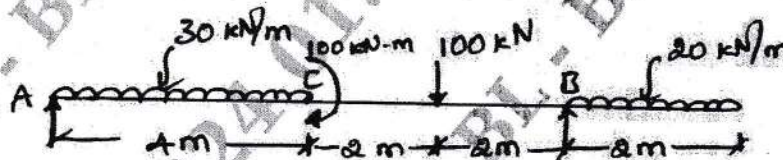


Fig.Q6(b)

(12 Marks)

Module-4

- 7 a. Derive equation of pure bending with usual notations. (10 Marks)
- b. A I-section consists of flanges $200 \times 15 \text{ mm}$ with web 10mm thick. Total depth of section is 500mm. If the beam carries a UDL of 65 kN/m over a span of 8m. Compute the bending and shear stresses at centre and support. Sketch their distributions. (10 Marks)

OR

- 8 a. Derive the torsion equation with usual notations. (10 Marks)
- b. A solid shaft is to transmit 300 kN-m at 100 rpm. If the shear stress of the material should not exceed 80 MPa, find the diameter required. What percentage saving in weight would be obtained if this shaft is replaced by a hollow one whose $d_i = 0.6d_o$, the length, material and shear stress remaining same. (10 Marks)

Module-5

- 9 a. Derive an expression for slope and deflection in a simply supported beam subjected to an UDL throughout. Calculate maximum slope and deflection. (08 Marks)
- b. Determine the slopes at A and B, deflections at C, D and F in the beam shown in Fig.Q9(b) in terms of EI.

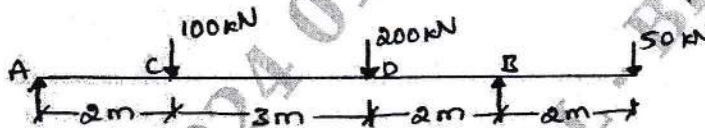


Fig.Q9(b)

(12 Marks)

OR

- 10 a. Derive the Euler's equation for buckling load on an elastic column with both ends pinned. (08 Marks)
- b. A simply supported beam of length 4m is subjected to a UDL of 30 kN/m over the whole span and deflects 15mm at the centre. Determine the crippling loads when this beam is used as column with the following conditions.
- (i) One end fixed and other end hinged.
 - (ii) Both ends pin jointed.

(12 Marks)

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18CV33

Third Semester B.E. Degree Examination, Dec.2023/Jan.2024 Fluid Mechanics

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- 1 a. Define following terms with their units :
- (i) Specific weight
 - (ii) Kinematic viscosity
 - (iii) Surface tension
 - (iv) Capillarity
 - (v) Bulk modulus
- (10 Marks)
- b. Calculate the pressure in excess of outside pressure for a water droplet of 4 mm diameter and for a water jet of 5 mm diameter. Assume surface tension of water as 0.073 N/m.
- (10 Marks)

OR

- 2 a. State and prove Pascal's law. (04 Marks)
- b. Establish a relationship among absolute, gauge and atmospheric pressure with simple sketch. (06 Marks)
- c. A simple u-tube manometer containing mercury is connected to a pipe in which a fluid of specific gravity 0.8 and having vacuum pressure is flowing. The other end of manometer is open to atmosphere. Find the vacuum pressure in pipe, if the difference of mercury level in the Two limbs is 40 cm and height of Fluid in left from the centre of pipe is 15 cm below. (10 Marks)

Module-2

- 3 a. Define the terms : (i) Total pressure (04 Marks)
(ii) Centre of pressure
- b. Obtain an expression for the force exerted and centre of pressure for a completely submerged inclined plane surface. (06 Marks)
- c. A circular plate 3.0 m diameter is immersed in a water in such a way that its greatest and least depth below the Free surface are 4 m and 1.5 m respectively. Determine the total pressure on one face of the plate and position of the centre of pressure. (10 Marks)

OR

- 4 a. Differentiate between :
- (i) Steady flow and uniform flow.
 - (ii) Rotational flow and irrotational flow. (04 Marks)
- b. Derive continuity equation for a 3-dimensional fluid flow in Cartesian co-ordinates. (08 Marks)
- c. The velocity potential function (ϕ) is given by an expression,

$$\phi = -\frac{xy^3}{3} - x^2 + \frac{x^3y}{3} + y^2$$

- (i) Find the velocity component in x and y direction
- (ii) Show that ϕ represents a possible case of flow. (08 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
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Module-3

- 5 a. Obtain an expression for Euler's equation of motion along a stream line and obtain Bernoulli's equation. (08 Marks)
- b. State and explain impulse momentum equation. (04 Marks)
- c. Water is flowing from a tapered pipe having diameters 350 mm and 200 mm at section 1 and 2 respectively. The flow rate through the pipe is $0.05 \text{ m}^3/\text{sec}$. The section 1 is 10 m above the datum and section 2 is 5 m above the datum. If the intensity of pressure at section 1 is 0.5×10^6 pascals. Find the intensity of pressure at section 2. (08 Marks)

OR

- 6 a. Derive the equation for discharge through venturimeter. (10 Marks)
- b. An oil of specific gravity 0.8 is flowing through a venturimeter having inlet diameter 20 cm and throat diameter 10 cm. The oil mercury differential manometer shows a reading of 25 cm. Calculate the discharge of oil through the horizontal venturimeter. Take $C_d = 0.98$. (10 Marks)

Module-4

- 7 a. Explain Hydraulic coefficients of an orifice and obtain relation between them. (06 Marks)
- b. Explain the classification of orifice and mouth pieces. (04 Marks)
- c. A rectangular orifice 1.5 m wide and 1.0 meter deep is discharging water from a tank. If the water level in the tank is 3.0 m above the top edge of the orifice. Find the discharge through the orifice. Take the co-efficient of discharging for orifice = 0.6. (10 Marks)

OR

- 8 a. Derive an expression for discharge over a rectangular notch. (10 Marks)
- b. Water flows over a rectangular weir 1 m wide at depth of 150 mm and afterwards passes through a triangular Right angled weir. Taking C_d for the rectangular and triangular weir as 0.62 and 0.59 respectively. Find the depth over the triangular weir. (10 Marks)

Module-5

- 9 a. Derive Darcy's equation for loss of head due to friction between two sections of pipe. (10 Marks)
- b. The rate of flow of water through a horizontal pipe is $0.25 \text{ m}^3/\text{sec}$. The diameter of pipe which 200 mm is suddenly enlarged to 400 mm. The pressure intensity in the smaller pipe is 11.772 N/cm^2 . Determine
 (i) Loss of head due to sudden enlargement. (ii) Pressure intensity in large pipe
 (iii) Power lost due to enlargement. (10 Marks)

OR

- 10 a. Explain the terms :
 (i) Hydraulic gradient line.
 (ii) Total energy line with the help of sketch. (06 Marks)
- b. Explain the different types of Minor loss of energy due to change of velocity in the pipes. (06 Marks)
- c. Calculate the discharge through a pipe of diameter 200 mm. When the difference of pressure between the two ends of a pipe 500 m apart is 4 m of water. Take the value of $f = 0.009$ in the formula $h_f = \frac{4fLV^2}{2gd}$ (08 Marks)

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Third Semester B.E. Degree Examination, Dec.2023/Jan.2024 Building Materials and Construction

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- 1 a. Explain the various natural agents responsible for deterioration of stones and different treatment methods adapted to preserve the stone work. (10 Marks)
- b. State the qualities of a good timber. (04 Marks)
- c. Explain the working of Pug mill with the help of a neat sketch. (06 Marks)

OR

- 2 a. State the characteristics of good clay bricks. (06 Marks)
- b. What is bulking of sand? How does it affect concrete mix? (04 Marks)
- c. Explain the following tests conducted on coarse aggregates.
 - (i) Aggregate impact value test
 - (ii) Specific gravity test. (10 Marks)

Module-2

- 3 a. Sketch the elevation and plan of (1, 3, 5 and 2, 4, 6 courses) of one brick thick English bond in brick masonry. (06 Marks)
- b. Explain cramped joint and plugged joints used in stone masonry with the help of neat sketches. (06 Marks)
- c. Explain the construction of strap footing with the help of a neat sketch. Also mention the situation where it is used. (08 Marks)

OR

- 4 a. List the different types of partition walls and also explain Brick nogging partition wall with the help of a neat sketch. (10 Marks)
- b. State the functions of foundations. (06 Marks)
- c. List any four situations in which the pile foundation is preferred. (04 Marks)

Module-3

- 5 a. Draw a neat sketch of segmental arch and label the components. (04 Marks)
- b. Draw a neat sketch of king post truss and label the components. (08 Marks)
- c. Define the following elements of pitched roof :
 - i) Purlin ii) Pitch iii) Truss iv) Common rafter. (08 Marks)

OR

- 6 a. Explain the procedure of laying vacuum dewatered flooring. (04 Marks)
- b. Draw a neat sketch of steel roof truss and label the components. (06 Marks)
- c. What is a lintel? Explain the following types of lintels with the help of neat sketches:
 - i) R.C.C lintel with chajja projection
 - ii) Steel lintel. (10 Marks)

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Module-4

- 7 a. With the help of a neat sketch, explain the salient features of framed and paneled door (double shutter). (08 Marks)
- b. Plan a dog legged stair for a building in which the vertical distance between the floors is 3.5 mts. The stair hall measures 3m × 5m. (08 Marks)
- c. Explain French window with the help of a neat sketch. (04 Marks)

OR

- 8 a. What is scaffolding? Explain the component parts of scaffolding. (08 Marks)
- b. State the three thumb rules followed to decide the dimensions of a step and common size of steps adapted for residential buildings. (04 Marks)
- c. With the help of a neat sketch, explain collapsible steel door. (08 Marks)

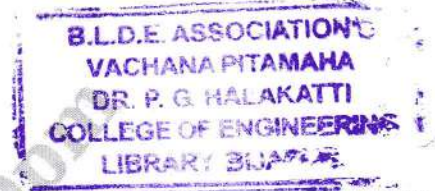
Module-5

- 9 a. Explain the procedure of painting new wooden and steel surfaces. (10 Marks)
- b. What is pointing? Sketch and explain the following types of pointings:
 (i) Flush pointing
 (ii) Struck pointing
 (iii) V-pointing
 (iv) Weathered pointing. (10 Marks)

OR

- 10 a. What are the requirements of an ideal material for damp proofing? (06 Marks)
- b. With the help of a neat sketch, explain the procedure of applying cement plaster in 2 coats. (06 Marks)
- c. Explain the different defects that may occur in a painting work. (08 Marks)

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18CV35

Third Semester B.E. Degree Examination, Dec.2023/Jan.2024 Basic Surveying

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- Briefly explain classification of survey based on objective of survey. (06 Marks)
 - With a neat sketch explain any two methods of obstacles to chaining but not for ranging. (06 Marks)
 - Define Precision, Accuracy, Plan and Map. (08 Marks)

OR

- Explain indirect ranging reciprocal ranging. (06 Marks)
 - Explain sloping ground distance measurement using indirect method. (06 Marks)
 - What is surveying? Explain classification based in nature of field of survey. (08 Marks)

Module-2

- Differentiate between Prismatic compass and Surveyor compass. (10 Marks)
 - The following bearing were observed with a compass with neat sketch calculate interior angles.

Line	AB	BC	CD	DE	EA
FB	60°	120°	50°	210°	300°

(10 Marks)

OR

- Define Dip, magnetic declination isoclinic line, and isogonics lines. (08 Marks)
 - Following are the observation taken form a closed traverse, balance the traverse by Bowditch rule.

Line	AB	BC	CD	DE	EA
Length	200m	130m	100m	250m	320
Latitude	-173.2	0	86.6	250	-154.9
Departure	100	130	50	0	-280

(12 Marks)

Module-3

- Briefly explain temporary adjustment of leveling. (08 Marks)
 - The following consecutive readings were taken with a level and 3 meter staff on continuously sloping ground at a common interval of 20 meters.
0.602, 1.234, 1.860, 2.574, 0.238, 0.914, 1.936, 2.872, 0.568, 1.824, 2.722.
The RL of first pt was 192.122. Rule out page of a level field book and enter the above readings. Calculate the reduced levels of the point and also the gradient of the line joining the first and last point (Rise and fall method). (12 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
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OR

- 6 a. Define Bench mark, Datum, Mean sea level and Reduced level. (10 Marks)
 b. Following readings have been taken from the page of an old level book. Reconstruct the page. Fill up missing quantizes and apply the usual checks :

Point	BS	IS	FS	Risc	Fall	RL	Remarks
1	3.125						B.M
2	X		X	1.325		125.005	T.P
3		2.320			0.055	X	
4		X				125.350	
5	X		2.655			X	T.P
6	1.620		3.205		2.165	X	T.P
7		3.625				X	
8			X			122.590	T.B.M

(10 Marks)

Module-4

- 7 a. What is orientation of plane table? Explain the various methods of orientation. (10 Marks)
 b. Explain radiation method of plane table surveying with a neat sketch. (10 Marks)

OR

- 8 a. What is resection? What are the different methods of resection? Explain any one method. (10 Marks)
 b. With a neat sketch explain two point problems. (10 Marks)

Module-5

- 9 a. With the help of neat sketch list the characteristics of contour. (10 Marks)
 b. The following perpendicular offset were taken at 10m intervals from a survey line to an irregular boundary line :
 3.25, 5.60, 4.20, 6.65, 8.75, 6.20, 3.25, 4.20 and 5.65.
 Calculate area by trapezoidal rule and Simpson's rule. (10 Marks)

OR

- 10 a. Define contours. What are the factors governing the choice of proper contour intervals? (10 Marks)
 b. Plot the following cross staff survey of a field ABCDEFG and calculate its area.

	750	D
	650	210E
C180	490	
	300	250F
B160	180	
	100	50G
	0	A

(10 Marks)

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18CV36

Third Semester B.E. Degree Examination, Dec.2023/Jan.2024 Engineering Geology

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- 1 a. Explain the role of engineering geology in the field of civil engineering projects. (08 Marks)
b. Describe the parts of the interior of the earth with neat sketches. (10 Marks)
c. Differentiate between rock and mineral. (02 Marks)

OR

- 2 a. Explain the following physical properties with suitable example.
i) Habit ii) Hardness iii) Diaphaneity. (09 Marks)
b. Write the physical properties of the following minerals and mention the engineering use of the minerals i) Quartz ii) Magnetite iii) Chromite. (09 Marks)
c. Explain the following: i) Rock forming minerals ii) Ore forming minerals. (02 Marks)

Module-2

- 3 a. Classify the Igneous rocks based on mode of origin and mineral composition. (08 Marks)
b. Add a note on engineering use of the following rocks
i) Granite ii) Basalt iii) Sandstone iv) Gneiss. (12 Marks)

OR

- 4 a. Briefly explain the classification of soil profile with neat sketches. (08 Marks)
b. Describe the drainage patterns with neat sketches. (06 Marks)
c. Explain the characteristics of rocks as materials for construction. (06 Marks)

Module-3

- 5 a. Explain the different types of unconformity with neat sketches and mention the engineering considerations. (10 Marks)
b. What are joints? Classify the different types of joints with neat sketches and add note on engineering considerations. (10 Marks)

OR

- 6 a. Describe the parts of the dam with neat sketches and their preventive measures to be taken for the selection of dam sites. (10 Marks)
b. Briefly explain the Rock Quality Determination (RQD) and Rock Structural Rating (RSR). (04 Marks)
c. Explain the following with neat sketches.
i) DIP ii) Strike iii) Outcrop. (06 Marks)

Module-4

- 7 a. Describe the vertical distribution of ground water with neat sketches. (07 Marks)
b. With neat sketches describe confined and unconfined aquifers. (09 Marks)
c. Explain the hydrological cycle with neat sketches. (04 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and/or equations written eg, 42+8 = 50, will be treated as malpractice.

OR

- 8 a. Explain the ground water explanation using Electrical resistivity method. (10 Marks)
b. Describe the following : (05 Marks)
i) Artificial recharge of ground water (05 Marks)
ii) Floods and its controls.

Module-5

- 9 a. What is earthquake? Describe the types, causes and effects of earth quake. (10 Marks)
b. Briefly explain the remedial measures for earthquake, Tsunami and Landslides. (10 Marks)

OR

- 10 Describe the following : (20 Marks)
i) Applications of Remote sensing in civil engineering projects
ii) Uses of geographic information system
iii) Topographic maps
iv) GPS Global Positioning System).

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18MAT31

Third Semester B.E. Degree Examination, Dec.2023/Jan.2024 Transform Calculus, Fourier Series and Numerical Techniques

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- 1 a. Find the Laplace transform of i) $e^{-t} \sin 3t$ ii) $\frac{\cos at - \cos bt}{t}$ (07 Marks)
- b. The square wave function $f(t)$ with period "a" is defined by

$$f(t) = \begin{cases} E & , 0 \leq t < a/2 \\ -E & , a/2 \leq t < a \end{cases}$$
 Show that $L\{f(t)\} = (E/s) \tan h (as/4)$. (06 Marks)
- c. Using Laplace transform method to solve $y'' - 3y' + 2y = e^{3t}$, $y(0) = 1$ and $y'(0) = 0$. (07 Marks)

OR

- 2 a. Find i) $L^{-1}\left\{\frac{s+2}{s^2-4s+13}\right\}$ ii) $L^{-1}\left\{\log\left(\frac{s+1}{s-1}\right)\right\}$ (07 Marks)
- b. Find the Laplace transform of $f(t) = \begin{cases} t-1 & , 1 < t < 2 \\ 3-t & , 2 < t < 3 \end{cases}$ by using unit - step function. (06 Marks)
- c. Find the inverse Laplace transform of $\frac{s^2}{(s^2+a^2)(s^2+b^2)}$, using Convolution theorem. (07 Marks)

Module-2

- 3 a. Find a Fourier series to represent $(x - x^2)$ from $x = -\pi$ to $x = \pi$. (07 Marks)
- b. Find the half - range cosine series for the function $f(x) = (x-1)^2$ in the interval $0 < x < 1$. (06 Marks)
- c. The following table gives the variations of periodic current over a period :

t(sec):	0	T/6	T/3	T/2	2T/3	5T/6	T
A(amp):	1.98	1.30	1.05	1.30	-0.88	-0.25	1.98

Show that there is a direct current part of 0.75 amp in the variable current and obtain the amplitude of the first harmonic. (07 Marks)

OR

- 4 a. Obtain Fourier series for the function

$$f(x) = \begin{cases} \pi x & , 0 \leq x \leq 1 \\ \pi(2-x) & , 1 \leq x \leq 2 \end{cases}$$

Deduce that $\frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} + \dots = \frac{\pi^2}{8}$.

- b. Find the half range Fourier sine series of $f(x) = x(\pi - x)$ (07 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
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- c. Obtain Fourier series for the function $f(x)$, given

$$\text{by } f(x) = \begin{cases} 1 + \frac{2x}{\pi} & , -\pi \leq x \leq 0 \\ 1 - \frac{2x}{\pi} & , 0 \leq x \leq \pi \end{cases}$$

(07 Marks)

Module-3

- 5 a. Find the Fourier transform of

$$f(x) = \begin{cases} 1 - x^2 & , |x| \leq 1 \\ 0 & , |x| > 1 \end{cases}$$

Hence evaluate $\int_0^{\infty} \left(\frac{\sin x - x \cos x}{x^3} \right) \cos(x/2) dx$.

(07 Marks)

- b. Find the Fourier sin transform of e^{-ax} , $a > 0$.

(06 Marks)

- c. Solve $u_{n+2} + 6u_{n+1} + 9u_n = 2^n$ with $u_0 = u_1 = 0$ by using Z - transforms.

(07 Marks)

OR

- 6 a. Find the Fourier transform of

$$f(x) = \begin{cases} 1 & , |x| < 1 \\ 0 & , |x| > 1 \end{cases} \quad \text{Hence evaluate } \int_0^{\infty} \frac{\sin x}{x} dx.$$

(07 Marks)

- b. Find the Z - transform of $\cos\left(\frac{n\pi}{2} + \frac{\pi}{4}\right)$.

(06 Marks)

- c. Find the Inverse Z - transform of $\frac{2z^2 + 3z}{(z+2)(z-4)}$.

(07 Marks)

Module-4

- 7 a. Employ Taylor's method to obtain approximate value of y at $x = 0.2$ for the differential equation $\frac{dy}{dx} = 2y + 3e^x$, $y(0) = 0$.

(07 Marks)

- b. Solve the differential equation $\frac{dy}{dx} = xy^2$ under the initial condition $y(0) = 1$ by using modified Euler's method at the point $x = 0.05$ ($h = 0.05$).

(07 Marks)

- c. Apply Milne's predictor - corrector formulae to compute $y(1.4)$ correct to four decimal

places. Given $\frac{dy}{dx} = x^2 + \frac{y}{2}$ and following the data $y(1) = 2$, $y(1.1) = 2.2156$,
 $y(1.2) = 2.4649$, $y(1.3) = 2.7514$.

(06 Marks)

OR

- 8 a. Using fourth order Runge Kutta method, compute $y(0.2)$. Given that $\frac{dy}{dx} = 3x + \frac{y}{2}$, $y(0) = 1$ (take $h = 0.2$).

(07 Marks)

- b. Using modified Euler's method to find $y(0.2)$ correct to four decimals by solving the equation $\frac{dy}{dx} = x - y^2$, $y(0) = 1$ by taking $h = 0.1$. (Perform 2 iterations in each step).

(07 Marks)

- c. Given $\frac{dy}{dx} = x^2(1+y)$ and $y(1) = 1$, $y(1.1) = 1.2330$, $y(1.2) = 1.5480$, $y(1.3) = 1.9790$.

Evaluate $y(1.4)$ by Adams - Bashforth method.

(06 Marks)

Module-5

- 9 a. Using fourth order Runge – Kutta method solve $y'' = x(y')^2 - y^2$ for $x = 0.2$ correct to four decimal places. Initial conditions are $x = 0$, $y = 1$ and $y' = 0$. (07 Marks)
- b. Solve the variational problem $\delta \int_0^1 \{x + y + (y')^2\} dx = 0$ under the conditions $y(0) = 1$ and $y(1) = 2$. (07 Marks)
- c. With usual notation prove that $\frac{\partial f}{\partial y} - \frac{d}{dx} \left(\frac{\partial f}{\partial y'} \right) = 0$. (06 Marks)

OR

- 10 a. Apply Milne's method to compute $y(0.4)$ given $y'' + xy' + y = 0$, $y(0) = 1$, $y(0.1) = 0.995$, $y(0.2) = 0.9802$, $y(0.3) = 0.956$ and $y'(0) = 0$, $y'(0.1) = -0.0995$, $y'(0.2) = -0.196$, $y'(0.3) = -0.2863$. (07 Marks)
- b. Solve the variational problem $\delta \int_0^{\pi/2} \{y^2 - (y')^2\} dx = 0$, $y(0) = 0$, $y(\pi/2) = 2$. (07 Marks)
- c. Prove that the geodesics on a plane are straight lines. (06 Marks)

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Third Semester B.E. Degree Examination, Dec.2023/Jan.2024
Geodetic Engineering

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- 1 a. Explain the basic principles of surveying with sketches. (06 Marks)
- b. Define the following:
- True meridian
 - Magnetic meridian
 - Arbitrary meridian
 - Magnetic declination
 - Local attraction
 - Angle of dip. (06 Marks)
- c. The following interior angles were measured with a sextant in a closed traverse. The bearing of the line AB was measured as $60^{\circ}00'$ with prismatic compass. Calculate the bearings of all other line if $\angle A = 140^{\circ}10'$, $\angle B = 99^{\circ}8'$, $\angle C = 60^{\circ}22'$, $\angle D = 69^{\circ}20'$. (08 Marks)

OR

- 2 a. Differentiate between prismatic compass and surveyors compass. (06 Marks)
- b. The following bearings were observed in running a close traverse:

Line	F.B	B.B
AB	$75^{\circ}5'$	$254^{\circ}20'$
BC	$115^{\circ}20'$	$296^{\circ}35'$
CD	$165^{\circ}35'$	$345^{\circ}35'$
DE	$224^{\circ}50'$	$44^{\circ}5'$
EA	$304^{\circ}50'$	$125^{\circ}5'$

- At what station do you suspect the local attraction? Determine the correct magnetic bearing's. If declination was $5^{\circ}10'$ E, what are true bearings? (08 Marks)
- c. Explain radiation method of plane table surveying's with a neat sketch. (06 Marks)

Module-2

- 3 a. Illustrate with neat sketches:
- Profile levelling
 - Differential levelling
 - Fly levelling
 - Reciprocal levelling. (08 Marks)
- b. What are the methods of levelling? Explain briefly. (06 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, $42+8=50$, will be treated as malpractice.

- c. The following figures were extracted from a level field book, some of the entries being illegible owing to exposure to rain. Insert the missing figures and check the results. Rebook all the figures by the rise and fall method.

Station	B.S	I.S	F.S	Rise	Fall	R.L	Remarks
1	2.285					232.460	B. M1
2	1.650		X	0.020			
3		2.105			X		
4	X		1.960	X			
5	2.050		1.925		0.300		
6		X		X		232.255	B. M2
7	1.690		X	0.340			
8	2.865		2.100		X		
9			X	X		233.425	B. M3

(06 Marks)

OR

- 4 a. Discuss the methods areas from offsets at regular intervals. (10 Marks)
 b. A railway embankment is 10m wide with side slope $1\frac{1}{2}$ to 1. Assuming the ground to be level in a direction transverse to the centre line, calculate the volume contained in a length of 120m, the centre heights at 20m intervals being in meters 2.2, 3.7, 3.8, 4.0, 3.5, 2.8, 2.5.

(10 Marks)

Module-3

- 5 a. With a neat sketch explain the component parts of theodolite. (10 Marks)
 b. Explain the temporary adjustments of transit theodolite. (10 Marks)

OR

- 6 a. Derive the expression for the horizontal distance, vertical distance and the elevation of an elevated object by double plane method. (10 Marks)
 b. The elevation of a point P is to be determined by observations from two adjacent stations of a tachometric survey. The staff was held vertically upon the point and the instrument is fitted within an anallactic lens, the constant of the instrument being 100. Compute the elevation of the point P from the following data, taking both the observations as equally trustworthy.

Station	Weight of axis	Staff point	Vertical angle	Staff readings	Elevation of station
A	1.42	P	$+2^{\circ} 24'$	1.230, 2.055, 2.880	77.750m
B	1.40	P	$-3^{\circ} 36'$	0.785, 1.800, 2.815	97.135m

(10 Marks)

Module-4

- 7 a. With the help of a neat sketch of a simple curve. Explain.
 i) Forward tangent
 ii) Point of intersection
 iii) Point of curve
 iv) Point of tangency
 v) Intersection angle
 vi) Tangent distance
 vii) Length of curve
 viii) Long chord.

(10 Marks)

- b. Two tangents intersect at a chainage 1250m the angle of intersection is $150'$. Calculate all the data necessary for setting out a curve of radius 250m by the deflection angle method. The peg interval may be taken as 20m. Prepare a setting out table when the least count of the vernier is $20''$. Calculate the data for field checking. (10 Marks)

OR

- 8 a. A compound curve is to connect two straights having a deflection angle of 90° . The lengths of the two transcripts are 350m and 400m respectively. Calculate the lengths of the two area if the radius of the first curve is be 300m. (10 Marks)
- b. A transition curve is required for a circular curve of 200m radius, the gauge being 1.5m and maximum super-elevation restricted to 15cm. The transition is to be designed for a velocity such that no lateral pressure is imposed on the rails and the rate of gain of radial acceleration is $30\text{cm}/\text{sec}^3$. Calculate the required length of the transition curve and the design speed. (10 Marks)

Module-5

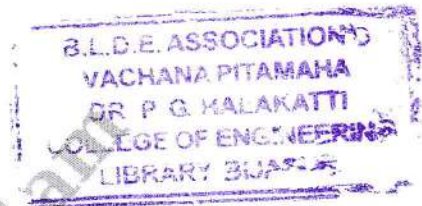
- 9 a. With a sketch write a note on relief displacement in vertical photograph and derive formula for relief displacement. (10 Marks)
- b. Define remote sensing. Explain the stages of idealized remote sensing system. (10 Marks)

OR

- 10 a. Define GIS. Give the components of GIS. Write a note on integration of remote sensing with GIS. (10 Marks)
- b. Mention the advantages of total station. Discuss on the functions of the same. (10 Marks)



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21CV33

Third Semester B.E. Degree Examination, Dec.2023/Jan.2024 Strength of Materials

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- 1 a. Sketch a typical stress-strain curve for the ductile material and explain briefly the salient features of the curve. (05 Marks)
- b. Derive an expression for the deformation of tapered circular bar subjected to axial force. (05 Marks)
- c. A steel tube of 30mm external diameter and 20mm internal diameter encloses a copper rod of 15mm diameter to which it is rigidly jointed at each end. If at a temperature of 10°C there is no longitudinal stress, calculate the stresses in the rod and tube when the temperature is raised to 200°C. Take E for steel and copper as $2.1 \times 10^5 \text{ N/mm}^2$ and $1 \times 10^5 \text{ N/mm}^2$ respectively. The value of coefficient of linear expansion for steel and copper is given as $11 \times 10^{-6} \text{ per } ^\circ\text{C}$ and $18 \times 10^{-6} \text{ per } ^\circ\text{C}$ respectively. (10 Marks)

OR

- 2 a. Define the three elastic constants and derive the relationship between them. (10 Marks)
- b. For the state of stress shown in Fig.Q2(b), determine the principal stresses and locate principal planes. Also obtain maximum tangential stress and locate corresponding planes.

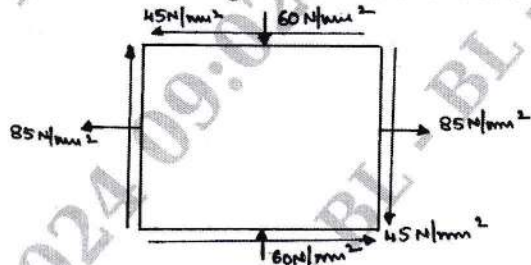


Fig.Q2(b) (10 Marks)

Module-2

- 3 a. Define shear force, bending moment and point of contraflexure. (06 Marks)
- b. Draw SFD and BMD for a simply supported beam shown in Fig.Q3(b). Also find the maximum bending moment and its location.

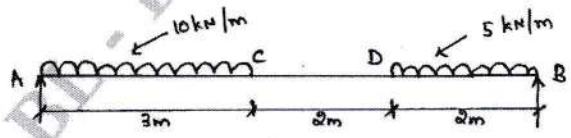


Fig.Q3(b) (14 Marks)

OR

- 4 a. Establish the relationship between shear force, bending moment and load intensity. (06 Marks)
- b. For a cantilever beam subjected to a UDL of intensity w/unit length throughout, plot the SFD and BMD. (06 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
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- c. Draw SFD and BMD for the beam shown in Fig.Q4(c) showing the salient points.

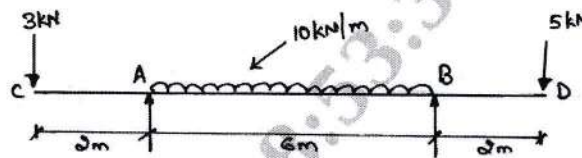


Fig.Q4(c)

(08 Marks)

Module-3

- 5 a. Derive the bending equation with usual notations. (10 Marks)
 b. A cast iron beam is of T-section as shown in Fig.Q5(b). The beam is simply supported on a span of 8m. The beam carries a UDL of 1.5 kN/m on the entire span. Determine the maximum tensile and compressive stress.

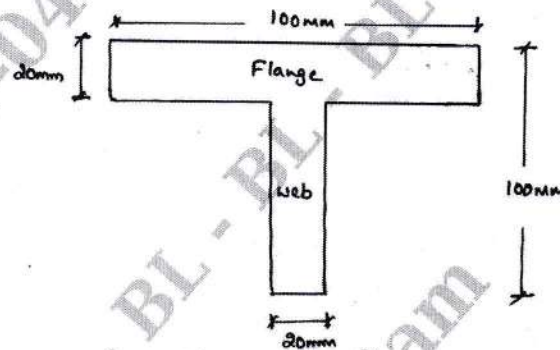


Fig.Q5(b)

(10 Marks)

OR

- 6 a. Define Neutral axis, Section modulus, shear stress and bending stress. (04 Marks)
 b. Write the assumptions made in simple bending theory. (04 Marks)
 c. A hollow box section 120mm wide and 200mm deep is having a uniform wall thickness of 10mm. Obtain the shear stress variation across the cross section. Shear force at the section is 120 kN. Refer Fig.Q6(c).

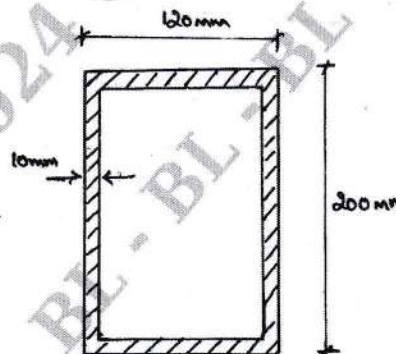


Fig.Q6(c)

(12 Marks)

Module-4

- 7 a. Derive the torsion equation for a circular shaft $\frac{T}{J} = \frac{\tau}{r} = \frac{G\theta}{L}$ with usual notations. (10 Marks)
 b. Find the diameter of the shaft required to transmit 60 kW at 150 rpm. If the maximum torque exceeds 25% of the mean torque for a maximum permissible shear stress of 60 MN/mm². Also find the angle of twist for a length of 4m. Take $G = 80$ GPa. (10 Marks)

OR

- 8 a. Derive Lamé's equation for radial and hoop stresses for thick cylinder subjected to internal and external fluid pressures. (10 Marks)
- b. A thin cylindrical shell 1m in diameter and 3m long has a metal wall of thickness 10mm. It is subjected to an internal fluid pressure of 3 MPa. Find the circumferential and longitudinal stresses in the wall. Determine the changes in length, diameter and volume of the cylinder. Also find the maximum shear stress in the cylinder. Take $E = 210 \text{ GPa}$ and $\mu = 0.3$. (10 Marks)

Module-5

- 9 a. Derive the Euler's equation for buckling load on a column with both ends hinged using usual notations. (10 Marks)
- b. Derive an expression for slope and deflection in a simply supported beam subjected to UDL throughout. Calculate maximum slope and deflection. (10 Marks)

OR

- 10 a. Define :
 i) Buckling load ii) Effective length iii) Slenderness ratio. (06 Marks)
- b. Differentiate between short and long column. (04 Marks)
- c. Determine the deflection at point B and rotation at A in the beam shown in Fig.Q10(c). Take $E = 200 \text{ kN/mm}^2$ and $I = 200 \times 10^6 \text{ mm}^4$.

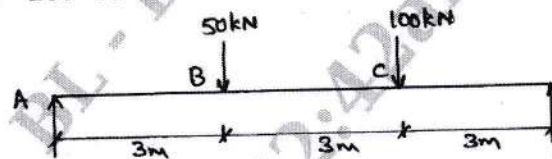
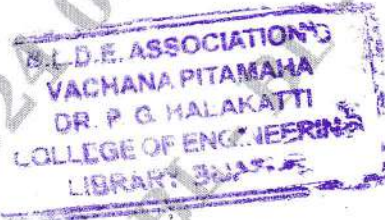


Fig.Q10(c)

(10 Marks)



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Third Semester B.E. Degree Examination, Dec.2023/Jan.2024 Earth Resources and Engineering

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- 1 a. With a neat sketch, explain the internal structure of the Earth. (08 Marks)
- b. What is Earthquake? Explain the types and causes of Earthquake. (08 Marks)
- c. Write a short note on Tsunami and its causes. (04 Marks)

OR

- 2 a. Write the importance of Geology in the field of Civil Engineering. (08 Marks)
- b. How Landslides are caused? Explain the preventive measures of Landslide. (08 Marks)
- c. Write a note on Cyclone and its causes. (04 Marks)

Module-2

- 3 a. What is Mineral? Explain classification of Minerals with examples. (04 Marks)
- b. Explain physical properties of any two Minerals : (06 Marks)
i) Hematite ii) Feldspar iii) Calcite.
- c. Explain the types of Rocks and write a note on Railway ballast and Decorative stones. (10 Marks)

OR

- 4 a. Explain the properties of any two : (06 Marks)
i) Lusture ii) Hardness iii) Cleavage.
- b. What is an Aquifer? Write the water bearing properties of an Aquifer. (08 Marks)
- c. What are Sedimentary Rocks? Explain the texture of Sedimentary Rocks. (06 Marks)

Module-3

- 5 a. What is Weathering? Explain the types of weathering. (08 Marks)
- b. Explain Soil profile with diagram and write the types of soil. (08 Marks)
- c. Write a note on Artificial recharge of groundwater. (04 Marks)

OR

- 6 a. What is Dam? Explain Geological conditions on Earthen dam , Gravity dam and Arch dam. (06 Marks)
- b. Write a short note on Interlinking of Rivers. (08 Marks)
- c. Write the effects of weathering on monumental rocks. (06 Marks)

Module-4

- 7 a. Three bore hole are sunk at three point of an equilateral triangle of 480m each. Where bore hole P is located West of Q and bore hole R is located North and midpoint of PQ and they reach coal seam at 100m, 220m and 260m depth respectively. Determine (10 Marks)
i) The Altitude (Dip and Strike)
ii) At what depth bore hole 'S' reaches sandstone bed if it is located at midpoint of QR.
Scale for triangle – 1 : 100 ; Scale for gradient – 1 in 1 units.

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

- b. With a neat diagram, explain Electrical resistivity method by using Wenner and Schlumberger method. (10 Marks)

OR

- 8 a. A limestone bed dips 25° East and it has width of 160m. Determine true thickness and vertical thickness. (Scale – 1 : 100). (04 Marks)
b. What are Faults? Explain types of Faults. (08 Marks)
c. What are Folds? Explain types of Folds. (08 Marks)

Module-5

- 9 a. Explain applications and uses of Remote sensing and GIS. (10 Marks)
b. Explain GPS , GPR and Drone applications in Civil Engineering. (10 Marks)

OR

- 10 a. What is Photogrammetry and write the applications of Photogrammetry. (10 Marks)
b. Write a short note on : (10 Marks)
i) Toposheet ii) Flight Planning iii) Scale.

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Third Semester B.E. Degree Examination, Dec.2023/Jan.2024 Transform Calculus Fourier Series & Numerical Techniques

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- 1 a. Find the Laplace transform of, (i) $e^{-3t} \sin 5t \cdot \cos 3t$ (ii) $\frac{e^{at} - e^{bt}}{t}$. (06 Marks)
- b. If a periodic function of period 'a' is defined by $f(t) = \begin{cases} E, & \text{for } 0 < t < \frac{a}{2} \\ -E, & \text{for } \frac{a}{2} < t < a \end{cases}$ then show that $L\{f(t)\} = \frac{E}{S} \tanh\left(\frac{as}{4}\right)$. (07 Marks)
- c. Using convolution theorem find the inverse Laplace transform of $\frac{s}{(s+2)(s^2+9)}$. (07 Marks)

OR

- 2 a. Express the function $f(t) = \begin{cases} \cos t & \text{for } 0 < t < \pi \\ \cos 2t & \text{for } \pi < t < 2\pi \\ \cos 3t & \text{for } t > 2\pi \end{cases}$ in terms of unit step function and hence find its Laplace transform. (07 Marks)
- b. Find the inverse Laplace transform of $\frac{2s^2 - 6s + 5}{s^3 - 6s^2 + 11s - 6}$. (06 Marks)
- c. Solve the differential equation $\frac{d^2y}{dt^2} + 4\frac{dy}{dt} + 4y = e^{-t}$ with $y(0) = y'(0) = 0$ by using Laplace transform. (07 Marks)

Module-2

- 3 a. Find a Fourier series to represent $f(x) = |x|$ in $-\pi \leq x \leq \pi$. (06 Marks)
- b. Obtain the half-range cosine series for $f(x) = x \sin x$ in $(0, \pi)$ and hence show that $\frac{\pi-2}{4} = \frac{1}{1.3} - \frac{1}{3.5} + \frac{1}{5.7} - \dots \infty$. (07 Marks)
- c. Express y as a Fourier series up to second harmonics for the following data :

x:	0	$\frac{\pi}{3}$	$\frac{2\pi}{3}$	π	$\frac{4\pi}{3}$	$\frac{5\pi}{3}$	2π
y:	1	1.4	1.9	1.7	1.5	1.2	1.0

(07 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

OR

- 4 a. Obtain the Fourier series expansion for the function, $f(x) = 2x - x^2$ in $(0, 2)$. (06 Marks)
- b. Find the half range sine series for the function, $f(x) = \begin{cases} \frac{1}{4} - x & \text{for } 0 < x < \frac{1}{2} \\ x - \frac{3}{4} & \text{for } \frac{1}{2} < x < 1 \end{cases}$ (07 Marks)
- c. The following table gives the variation of periodic current over period :

t sec :	0	$\frac{T}{6}$	$\frac{T}{3}$	$\frac{T}{2}$	$\frac{2T}{3}$	$\frac{5T}{6}$	T
A (amp) :	1.98	1.30	1.05	1.30	-0.88	-0.25	1.98

Show that there is a direct current part of 0.75 amp in the variable current and obtain the amplitude of the first harmonic. (07 Marks)

Module-3

- 5 a. Find the Fourier transform of the function $f(x) = \begin{cases} 1 - x^2 & \text{for } |x| \leq 1 \\ 0 & \text{for } |x| > 1 \end{cases}$. Hence evaluate $\int_0^{\infty} \left(\frac{x \cos x - \sin x}{x^3} \right) dx$. (06 Marks)
- b. Find the Fourier sine and cosine transform of $f(x) = \begin{cases} x & \text{if } 0 < x < 1 \\ 2 - x & \text{if } 1 < x < 2 \\ 0 & \text{otherwise} \end{cases}$. (07 Marks)
- c. Find the z-transform of $\cosh\left(n \frac{\pi}{2} + \theta\right)$. (07 Marks)

OR

- 6 a. Find the Fourier sine transform of $f(x) = e^{-ax}$, $a > 0$. (06 Marks)
- b. Find the inverse z transform of $\frac{18z^2}{(2z-1)(4z+1)}$. (07 Marks)
- c. Solve the difference equation $u_{n+2} + 6u_{n+1} + 9u_n = z^n$ with $u_0 = u_1 = 0$ using z-transform. (07 Marks)

Module-4

- 7 a. Classify the following partial differential equations :
- (i) $\frac{\partial^2 u}{\partial x^2} + 4 \frac{\partial^2 u}{\partial x \partial y} + 4 \frac{\partial^2 u}{\partial y^2} - \frac{\partial u}{\partial x} + 2 \frac{\partial u}{\partial y} = 0$.
- (ii) $x^2 \frac{\partial^2 u}{\partial x^2} + (1 - y^2) \frac{\partial^2 u}{\partial y^2} = 0$, $-\infty < x < \infty$, $-1 < y < 1$.
- (iii) $(1 + x^2) \frac{\partial^2 u}{\partial x^2} + (5 + 2x^2) \frac{\partial^2 u}{\partial x \partial t} + (4 + x^2) \frac{\partial^2 u}{\partial t^2} = 0$.
- (iv) $(x + 1) \frac{\partial^2 u}{\partial x^2} - 2(x + 2) \frac{\partial^2 u}{\partial x \partial y} + (x + 3) \frac{\partial^2 u}{\partial y^2} = 0$. (10 Marks)
- b. Evaluate the values at the mesh points for the equation $u_{tt} = 16u_{xx}$ taking $h = 1$ upto $t = 1.25$. The boundary conditions are $u(0, t) = u(5, t) = 0$ and the initial conditions are $u(x, 0) = x^2(5 - x)$ and $u_t(x, 0) = 0$. (10 Marks)

OR

- 8 a. Using Schmidt two-level formula to solve the equation $\frac{\partial^2 u}{\partial x^2} = \frac{\partial u}{\partial t}$ under the conditions,
- (i) $u(0, t) = u(1, t) = 0 \quad t \geq 0$
- (ii) $u(x, 0) = \sin \pi x, \quad 0 < x < 1$ by taking $h = \frac{1}{4}$ and $\alpha = \frac{1}{6}$ co. (10 Marks)
- b. Solve the two-dimensional Laplace equation $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$ at the interior mesh points of the square region and the values of u at the mesh points on the boundary are shown in Fig.Q8 (b).

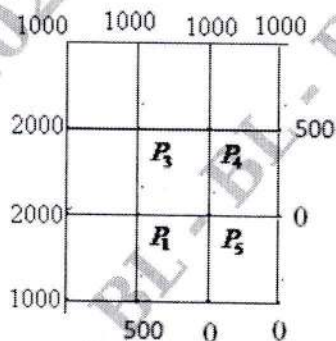


Fig. Q8 (b)

(10 Marks)

Module-5

- 9 a. Using Runge-Kutta method of 4th order to solve the differential equation $\frac{d^2 y}{dx^2} + 2x \frac{dy}{dx} - 4y = 0$ with $y(0) = 0.2$ and $y'(0) = 0.5$ for $x = 0.1$. Correct to four decimal places. (07 Marks)
- b. State and prove Euler's equation. (07 Marks)
- c. Find the extremal of the functional $I = \int_0^{\frac{\pi}{2}} (y^2 - y'^2 - 2y \sin x) dx$ under the end conditions $y(0) = 0, y\left(\frac{\pi}{2}\right) = 0$ (06 Marks)

OR

- 10 a. Apply Milne's method to compute $y(0.3)$. Given that $\frac{d^2 y}{dx^2} = 1 - 2y \frac{dy}{dx}$ and $y(0) = 0, y(0.2) = 0.02, y(0.4) = 0.0795, y(0.6) = 0.1762, y'(0) = 0, y'(0.2) = 0.1996, y'(0.4) = 0.3937, y'(0.6) = 0.5689$ (07 Marks)
- b. Prove that the shortest distance between two points in a plane is a straight line. (07 Marks)
- c. Find the extremal of the functional $I = \int_{x_1}^{x_2} (y^2 + y'^2 + 2ye^x) dx$ (06 Marks)

CBCS SCHEME

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BCV301

Third Semester B.E/B.Tech. Degree Examination, Dec.2023/Jan.2024 Strength of Materials

Time: 3 hrs.

Max. Marks:100

- Note:** 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.
3. Missing data, if any, may be suitably assumed.

		Module - 1	M	L	C
1	<p>a. Define the following terms :</p> <ul style="list-style-type: none"> i) Poisson's ratio ii) Modulus of rigidity iii) Impact load iv) Volumetric strain. 	<div style="border: 1px solid black; padding: 5px; width: fit-content; margin: auto;"> <p style="font-size: small; margin: 0;">B.L.D.E. ASSOCIATION'S VACHANA PITAMAH DR. P. G. HALAKATTI COLLEGE OF ENGINEERING LIBRARY BANGALORE</p> </div>	4	L1	CO1
	<p>b. The following data refers to mild steel tested on a lab. Diameter of the specimen 25mm, length of the specimen 300mm, Extension under a load of 15kN is 0.045mm, load at yield point 127.65kN, max load 208.60kN, length of the specimen at failure 375mm, diameter at failure 17.75mm. Determine young's modulus, yield strength, ultimate strength, % elongation of the specimen, % decrease in c/s at area of specimen.</p>		10	L3	CO1
	<p>c. A brass bar having cross-sectional area 300sq.mm is subjected to axial forces as shown in the Fig.Q1(c). Determine the total elongation of the bar taking $E = 84\text{GPa}$.</p>	<p style="text-align: center; font-size: small;">Fig.Q1(c)</p>	6	L3	CO1

OR

2	<p>a. A steel rod 20mm diameter, length 6m is connected at the ends to a pair of walls at a temperature of 120°C. Find the pull exerted on the wall if the temperature falls to 40°C when :</p> <ul style="list-style-type: none"> i) Supports don't yield ii) Supports yield by 1.1mm, take $E = 200\text{GPa}$. $\alpha = 12 \times 10^{-6}/^\circ\text{C}$. 	6	L3	CO1
	<p>b. Derive the relationship between modulus of elasticity, modulus of rigidity and Poisson's ratio.</p>	6	L3	CO1
	<p>c. A load of 270kN is acting on a short RCC column of size $(200 \times 200)\text{mm}^2$. The column is reinforced with 10 bars of 12mm diameter. Determine the loads and the corresponding stresses on steel and concrete.</p>	8	L3	CO1

Module - 2

3	a.	Define Hogging Bending moment and sagging bending moment.	4	L2	CO2
	b.	Derive the relationship between loading, shear force and bending moment.	6	L3	CO2
	c.	A simply supported beam is subjected to point load of 15kN together with a udl of 15kN/m as shown in the Fig.Q3(c). Draw SFD and BMD. Find also point of low shear and the corresponding bending moment.	10	L3	CO2

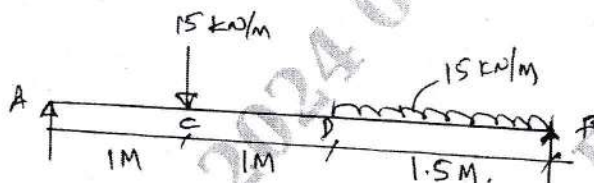


Fig.Q3(c)

OR

4	a.	Show that maximum bending moment for a simply supported beam carrying udl of intensity w /unit length is $\frac{wl^2}{8}$.	6	L2	CO2
	b.	Draw SFD and BMD for an overhanging beam carrying forces as shown in the Fig.Q4(b).	14	L3	CO2

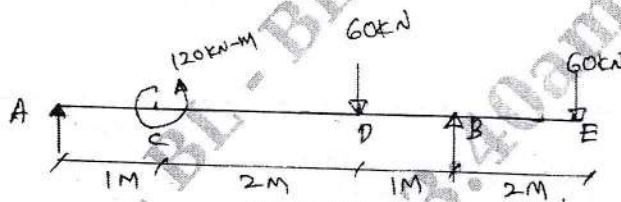


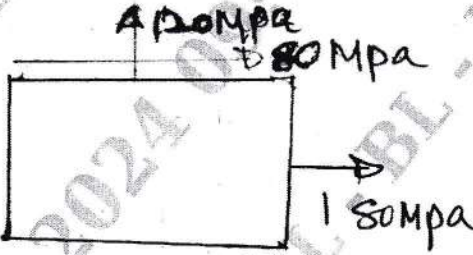
Fig.Q4(b)

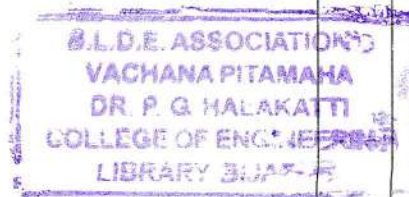
Module - 3

5	a.	Define : i) Modulus of rupture ii) Section modulus iii) Flexural rigidity.	6	L1	CO3
	b.	Derive bending equation with usual notation.	6	L3	CO3
	c.	A simply supported beam of span 5m has cross section 150mm × 250mm. If the permissible stress is 10N/mm ² . Find : i) Maximum intensity of UDL it can carry ii) Maximum concentrated kind P applied 2m from one end.	8	L3	CO3

OR

6	a.	List the assumptions made pure torsion.	6	L1	CO3
	b.	Derive torque - equation with usual notation.	4	L3	CO3
	c.	A solid shaft has to transmit 250KW power at 100rpm. If the shear stress not to exceed 75MPa what should be the diameter of the shaft. If this shaft is to be replaced by a hollow shaft whose internal diameter, is 0.6 times the external diameter determine the size of the shaft. Also determine the saving on the weight of the material. Assume max shear stress remain the same for both the shafts.	10	L3	CO3

Module - 4					
7	a.	Define slope, deflection and curvature.	6	L1	CO4
	b.	Derive moment-curvature equation.	6	L3	CO4
	c.	A girder of uniform section and constant depth is simply supported over a span of 3m. If the point load at the mid span is 30kN and $I_{XX} = 15.614 \times 10^{-6} \text{m}^4$, calculate : i) Central deflection ii) The slopes at the ends if he beam. Take $E = 200\text{GN/m}^2$.	8	L3	CO4
OR					
8	a.	Differentiate between long columns and short columns.	4	L1	CO4
	b.	Derive Euler's Buckling load for long columns whose ends are hinged.	6	L3	CO4
	c.	A hallow tube 6m length of external diameter 16mm and thickness 10mm is subjected to minimum crippling load. Find Euler's load for this column when : i) Both ends fixed ii) One end fixed and other end hinged. Take $E = 200\text{GPa}$.	10	L3	CO4
Module - 5					
9	a.	Derive principle planes and principle stresses.	4	L1	CO5
	b.	Differentiate between thin cylinders and thick cylinders.	4	L1	CO5
	c.	The state of stress at a point on a strained material is 120Mpa and is an as shown in the Fig.Q9(c). Determine : i) The direction of principal planes ii) The magnitude of principal stresses iii) The magnitude of maximum shear stress and its directions. Sketch the stresses and planes.	12	L3	CO5
			Fig.Q9(c)		
OR					
10	a.	Drive Lamé's equation with usual notation.	8	L3	CO5
	b.	A shell 3.25m long; 1m in diameter is subjected to internal fluid pressure of 1MPa, if the thickness of the shell is 10mm find : i) Hoop-stress ii) Longitudinal stress iii) Maximum shear stress iv) Change in diameter and length v) Volumetric strain and hence measure in volume Take $E = 2 \times 10^3 \text{MPa}$; $\frac{1}{m} = 0.30$.	12	L3	CO5



CBCS SCHEME

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BCV302

Third Semester B.E./B.Tech. Degree Examination, Dec.2023/Jan.2024 Engineering Survey

Time: 3 hrs.

Max. Marks: 100

*Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.*

Module – 1			M	L	C
Q.1	a.	Explain in brief about: i) Topographical survey ii) Cadastral survey iii) Hydrographic survey iv) Control survey v) Under ground survey.	10	L2	CO1
	b.	Discuss in detail about the advantages and disadvantages of plane table survey.	5	L2	CO1
	c.	Explain classification of survey by objective of survey.	5	L2	CO1
OR					
Q.2	a.	Discuss in detail about the EDM.	10	L2	CO1
	b.	List and discuss the sources of errors in compass survey.	5	L2	CO1
	c.	Explain the classification of survey by nature of survey.	5	L2	CO1
Module – 2					
Q.3	a.	Explain in detail the procedure for the measurement of horizontal angle by theodolite by repetition method.	10	L2	CO2
	b.	What are the accessories and advantages of total station survey?	5	L2	CO2
	c.	The following staff readings were observed successively with a level the instrument is moved by 3 rd , 6 th and 8 th readings 2.228, 1.606, 0.988, 2.090, 2.864, 1.262, 0.602, 1.982, 1.044, 2.684m record the readings in a level book and calculate RL, if the first reading was taken at a B.M of 432.384m use HI method.	5	L3	CO2
OR					
Q.4	a.	Explain in detail the procedure for differential leveling by plane of collimation method using dumpy level.	10	L2	CO2
	b.	Explain in detail how horizontal angle is measured with the total station.	5	L2	CO2
	c.	The following observations were taken with dumpy level and 4m leveling staff. The instrument was shifted after 4 th and 7 th reading. The first reading was taken on a bench mark whose RL was 15.575m. Prepare a page of level book and calculate RL of all the points. The observations were taken at every 30m interval. Also find out the gradient between first and last point use rise and fall method. Observations are 0.565, 1.250, 1.675, 3.695, 0.125, 2.345, 0.500, 1.785 and 2.535.	5	L3	CO2

Module – 3

Q.5	a.	Discuss in detail about characteristics of contours.	10	L2	CO3
	b.	Explain the procedure of conducting the L/S and C/S by using level.	10	L2	CO3

OR

Q.6	a.	Discuss in detail about contouring using level.	10	L2	CO3
	b.	Explain how coordinates are measured using total station.	10	L2	CO3

Module – 4

Q.7	a.	For applying Rankine's method, provide the procedure of setting out of horizontal curve.	10	L3	CO4
	b.	Explain the procedure of setting out two room building by center line method.	10	L2	CO4

OR

Q.8	a.	Explain how areas are measured by trapezoidal and Simpson's rule.	10	L2	CO4
	b.	A railway embankment is 10m wide with side slope $1\frac{1}{2}$ to 1. Assuming the ground to be level in a direction transverse to the center line, calculate the volume contained in a length of 120m, the center heights at 20m intervals being in meters are 2.200, 3.700, 3.800, 4.000, 3.800, 2.800, 2.500. Calculate volume by trapezoidal rule and prismoidal rule.	10	L3	CO4

Module – 5

Q.9	a.	What is absolute and differential positioning with GPS? Explain about Gagan system in India.	10	L2	CO5
	b.	What are the applications and advantages of surveying with drone?	10	L3	CO5

OR

Q.10	a.	What are the applications and uses of remote sensing and GIS in engineering surveying.	10	L3	CO5
	b.	Outline the process of drone surveying.	10	L2	CO5

CBCS SCHEME

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BCV303

Third Semester B.E./B.Tech. Degree Examination, Dec.2023/Jan.2024 Engineering Geology

Time: 3 hrs.

Max. Marks: 100

*Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.*

Module – 1			M	L	C
Q.1	a.	Explain the role of Geology in the Civil Engineering.	08	L2	CO1
	b.	What is Plate tectonics? Explain different type of plate boundaries.	06	L2	CO1
	c.	Explain causes, effects of earthquake.	06	L2	CO1
OR					
Q.2	a.	Explain briefly the internal structure of the earth.	10	L2	CO1
	b.	Write short notes on: i) Tsunami – causes and effect ii) Land Slides – causes and remedial measures	10	L1	CO1
Module – 2					
Q.3	a.	What is a mineral? Describe the following physical properties of a mineral. i) Quartz ii) Hematite iii) Gypsum.	12	L2	CO2
	b.	Enumerate the classification of Igneous Rocks.	08	L2	CO2
OR					
Q.4	a.	What is Metamorphism? Explain the different kinds of metamorphism with example.	08	L2	CO2
	b.	Describe the following rocks for its geological/physical and engineering properties and its suitability as building material. i) Granite ii) Lime Stone	08	L2	CO2
	c.	Describe the character of good building stones.	04	L2	CO2
Module – 3					
Q.5	a.	What is weathering? Explain the types of weathering.	08	L2	CO3
	b.	Distinguish between Black Cotton Soil and Laterite Soil.	06	L2	CO3
	c.	Explain the effect of weathering on Monumental rock.	06	L2	CO3
OR					
Q.6	a.	Explain soil formation and its profile.	10	L2	CO3
	b.	Explain the classification of soil based on their grain size.	06	L2	CO3
	c.	Write a note on drifted soil.	04	L1	CO3
Module – 4					
Q.7	a.	A bed of shale is dipping maximum of 32° along S45°E. Determine the amount of its apparent dip along S80°E. (Solve by Graphical / Trigonometric method).	06	L3	CO4
	b.	What are folds? Explain briefly the different types of folds with neat sketches.	10	L2	CO4
	c.	On a horizontal tunnel, a bed of sandstone dips 30° eastward. Its true thickness is 200m. Determine its vertical thickness and width of the out crop in the tunnel. [Scale : 1cm = 100m].	04	L3	CO4

OR					
Q.8	a.	Three test bore holes (P, Q, R) are sunk at 3 point of an equilateral triangle, whose sides are 480m each. P is west of Q and R is midpoint of PQ. Bore holes P, Q and R reach the upper surface of a rich coal seam at 100 m, 220 m and 260 m depth respectively. Determine i) The altitude [Dip and Strike] of the coal seam ii) Another borehole 'S' is sunk exactly at midpoint of QR. Determine at what depth the new bore hole reaches the same coal seam.	10	L3	CO4
	b.	Explain the impact of faults on Dam and Tunnel project.	04	L2	CO4
	c.	What are Faults? Explain the parts of Faults.	06	L2	CO4
Module – 5					
Q.9	a.	Define Aquifer. Explain briefly the different types of Aquifer with a neat sketch.	12	L2	CO5
	b.	Explain water bearing properties of Rocks.	08	L2	CO5
OR					
Q.10	a.	Explain the electric resistivity method for exploration of Ground Water.	12	L2	CO5
	b.	Explain the factors affecting permeability of Rocks.	08	L2	CO5

CBCS SCHEME

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BCV304

Third Semester B.E./B.Tech. Degree Examination, Dec.2023/Jan.2024 Water Supply and Waste Water Engineering

Time: 3 hrs.

Max. Marks: 100

*Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.*

Module – 1				M	L	C												
Q.1	a.	Briefly explain : i) Factors affecting per capita demand of water. ii) Factors affecting design period. iii) Domestic water demand.	12		L2	CO1												
	b.	Explain the need and importance of protected water supply to the community.	8		L2	CO1												
OR																		
Q.2	a.	The population of 5 decades from 1980 to 2020 are given in below table. Find out the population after 3 decades beyond the last known decades by using arithmetic increase method.	12		L2	CO1												
		<table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td style="padding: 2px;">Year</td> <td style="padding: 2px;">1980</td> <td style="padding: 2px;">1990</td> <td style="padding: 2px;">2000</td> <td style="padding: 2px;">2010</td> <td style="padding: 2px;">2020</td> </tr> <tr> <td style="padding: 2px;">Population</td> <td style="padding: 2px;">25,000</td> <td style="padding: 2px;">28,000</td> <td style="padding: 2px;">34,000</td> <td style="padding: 2px;">42,000</td> <td style="padding: 2px;">47,000</td> </tr> </table>	Year	1980	1990	2000	2010	2020	Population	25,000	28,000	34,000	42,000	47,000				
Year	1980	1990	2000	2010	2020													
Population	25,000	28,000	34,000	42,000	47,000													
	b.	List different methods of population forecasting. Explain briefly Arithmetical and Geometrical Increase method.	8		L2	CO1												
Module – 2																		
Q.3	a.	Explain the objectives of Water treatment or Water purification.	4		L2	CO2												
	b.	Describe briefly the construction and working of coagulation sedimentation tank with neat sketch.	10		L2	CO2												
	c.	Briefly explain the terms : i) Sedimentation ii) Coagulation iii) Flocculation.	6		L2	CO2												
OR																		
Q.4	a.	The maximum daily demand at a water purification plant has been estimated as 12 million litres per day. Design the dimensions of a suitable sedimentation tank (fitted with mechanical sludge removal arrangements) for the raw supplies , assuming a detention period of hours and velocity of flow as 20cm per minute.	8		L2	CO2												
	b.	List the coagulants used in water treatment.	4		L2	CO2												
	c.	Briefly explain the mechanism of Filtration.	8		L2	CO2												
Module – 3																		
Q.5	a.	What is Disinfection of water? What are the characteristics of good disinfectant?	6		L2	CO3												

	b.	Explain the different types of sewerage system with their merits and demerits of suitability.	12	L2	CO3
OR					
Q.6	a.	Calculate the velocity of flow and discharge of sewer of a circular section having a diameter of 1m laid at a gradient of 1 in 500. Use Manning's formula taking $N = 0.012$. Assume that the sewer is running half full.	8	L3	CO3
	b.	Explain the process and objective of sampling with different methods.	6	L2	CO3
	c.	Explain DWF and WWF.	6	L2	CO3
Module – 4					
Q.7	a.	Illustrate the layout of a conventional municipal treatment plant and infer upon importance of each unit in sanitation.	10	L2	CO4
	b.	Elucidate the working principle of sludge digester, with a neat labeled sketch.	6	L2	CO4
	c.	Explain different types of screens.	4	L2	CO4
OR					
Q.8	a.	Discuss briefly with a neat sketch Grit Chamber and Oil and Grease removal tank.	10	L2	CO4
	b.	Explain the working of Conventional Activated Sludge Process (ASP) with flow diagram.	10	L2	CO4
Module – 5					
Q.9	a.	Determine the size of a high rate trickling filter for the following data : i) Sewage flow = 4.5 m ³ /d ii) Recirculation Ratio = 1.5 iii) BOD of raw sewage = 250 mg/ℓ. iv) BOD Removal in primary settling tank = 30%. v) Final effluent BOD desired = 30 mg/ℓtr.	10	L3	CO5
	b.	Explain the concept of BoD and CoD. Enumerate their limitation.	6	L2	CO5
	c.	Briefly explain Self – Cleansing Velocity.	4	L2	CO5
OR					
Q.10	a.	Draw a neat sketch of Skimming tank. Enumerate importance of Skimming tank.	10	L2	CO5
	b.	Draw and explain Oxidation Pond and Oxidation ditch.	10	L2	CO5

CBCS SCHEME

BCV358D

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Question Paper Version : A

Third Semester B.E./B.Tech. Degree Examination, Dec.2023/Jan.2024 Personality Development for Civil Engineers

Time: 1 hr.]

[Max. Marks: 50

INSTRUCTIONS TO THE CANDIDATES

1. Answer all the **fifty** questions, each question carries one mark.
2. Use only **Black ball point pen** for writing / darkening the circles.
3. **For each question, after selecting your answer, darken the appropriate circle corresponding to the same question number on the OMR sheet.**
4. Darkening two circles for the same question makes the answer invalid.
5. **Damaging/overwriting, using whiteners** on the **OMR** sheets are strictly prohibited.

-
1. Why is reading comprehension important:
 - a) It helps in ignoring details
 - b) It enhances vocabulary only
 - c) It aids in understanding and interpreting written information
 - d) It is irrelevant in Professional setting
 2. Which component of personality development involves understanding oneself:
 - a) Self Awareness
 - b) Self Management
 - c) Personal SWOT
 - d) Positive Attitude
 3. What does personal SWOT analysis focus on :
 - a) Identifying personal strengths, weakness, opportunities and threats
 - b) Ignoring personal development
 - c) Downplaying strengths
 - d) Only considering external factors.
 4. Which of the following is a barrier to effective listening:
 - a) Empathy
 - b) Open-mindedness
 - c) Prejudice and biases
 - d) Clarification
 5. What is the primary goal of listening comprehension :
 - a) To ignore the speaker
 - b) To understand and interpret the message
 - c) To interrupt the speaker
 - d) To speak simultaneously
 6. How can active listening be demonstrated
 - a) Nodding and Providing Feedback
 - b) Ignoring the speaker
 - c) Avoiding eye contact
 - d) Interrupting frequently
 7. What is a key aspect of effective speaking:
 - a) Speaking in a monotone voice
 - b) Using complex jargon
 - c) Clarity and articulation
 - d) Avoiding eye contact

8. What is an essential skill in the art of speaking:
 - a) Speaking in a rushed manner
 - b) Using vague language
 - c) Effective use of Pauses and Pacing
 - d) Ignoring the audience
9. Which of the following is a non-verbal aspect of effective speaking:
 - a) Pronunciation
 - b) Facial Expressions
 - c) Vocabulary
 - d) Grammar
10. Listening comprehension involves:
 - a) Ignoring the speakers message
 - b) Understanding and interpreting spoken information
 - c) Talking over the speaker
 - d) Using non-verbal cues excessively
11. In the stages of team development, which stage involves conflict and competition among team members:
 - a) Forming
 - b) Storming
 - c) Norming
 - d) Performing
12. Which type of team is composed of individuals with similar skills and functions :
 - a) Cross-Functional Team
 - b) Self-Directed Team
 - c) Functional Team
 - d) Task Force
13. What is the role of a Team leader in a team :
 - a) Activity participates in tasks and discussions
 - b) Coordinates efforts to achieve team objectives
 - c) Provides guidance and direction
 - d) Ensures effective communication and collaboration
14. In a team presentation, what does unified gestures among team members convey:
 - a) Conflict
 - b) Independence
 - c) Cohesion
 - d) Disinterest
15. What does the "4P's of presentation" refer to :
 - a) Plan, Practice, Perform, Posture
 - b) Purpose, Practice, Posture, Performance
 - c) Preparation, Purpose, Practice, Performance
 - d) Plan, Posture, Presentation, Practice.
16. How does effective communication contribute to building rapport with the audience:
 - a) Using complex vocabulary
 - b) Ignoring non-verbal cues
 - c) Fostering a connection and encouraging participation
 - d) Talking at a rapid pace.
17. How does presenting with confidence impact the audience:
 - a) It creates a sense of disinterest
 - b) It builds trust and credibility
 - c) It confuses the audience
 - d) It diminishes the importance of the message
18. What is a key element in communicating with credibility?
 - a) Exaggeration
 - b) Consistency
 - c) Avoiding eye contact
 - d) Using complex jargon
19. Which of the following is not Part of the 4P's of presentation?
 - a) Preparation
 - b) Purpose
 - c) Perfection
 - d) Practice
20. Which non-verbal cue involves the physical distance between individuals during interactions:
 - a) Facial Expression
 - b) Handshake
 - c) Proxemics
 - d) Gestures
21. What is the primary purpose of critical thinking :
 - a) Accepting information without questioning
 - b) Analyzing and evaluating information
 - c) Avoiding all forms of decision making
 - d) Ignoring alternative perspectives

22. Which principle involves evaluating information without bias:
a) Open mindedness
b) Logic
c) Objectivity
d) Evidence based thinking
23. What is a common outcome of collaborative problem solving:
a) Decreased efficiency
b) Better solutions
c) Increased complexity
d) Avoidance of problems
24. What is the first step in the problem solving process:
a) Evaluate and select the best solution
b) Define the problem
c) Implement the solution
d) Generate possible solutions
25. Which can hinder effective problem solving in a group?
a) Open-mindedness
b) Group think
c) Lack of information
d) Emotional blocks
26. What is a key element of time management?
a) over commitment
b) Punctuality
c) Procrastination
d) Avoiding schedules
27. Analyze the common time-waster:
a) Prioritization
b) Multitasking Efficiency
c) Clear Goals
d) Procrastination
28. Which attribute ensures that a goal is realistic in SMART goals:
a) Achievable
b) Relevant
c) Measurable
d) Specific
29. Which type of Etiquette involves behavior at social gatherings:
a) Business Etiquette
b) Social Etiquette
c) Dining Etiquette
d) Workplace Etiquette
30. What is a key element of Phone Etiquette:
a) Unprofessional tone
b) Prompt responses
c) Lack of clarity
d) Ignoring calls
31. What is fundamental quality of effective leadership:
a) Micromanagement
b) Authoritative decision making
c) Empathy and Inspiration
d) Exclusivity
32. Which of the following is crucial for building trust within a team:
a) Micromanagement
b) Open and transparent communication
c) Authoritative decision making
d) Autonomy
33. What role does creativity play in fostering innovation within a team
a) It hinders problem-solving
b) It encourages the status quote
c) It leads to rigid thinking
d) It generates new ideas and solutions
34. How do leaders differ from bosses:
a) Leaders focus on authority and control
b) Leaders inspire and motivate, while bosses dictate
c) Bosses delegate effectively
d) Bosses prioritize individual achievements
35. What is characteristic of effective decision making :
a) Indecision and hesitation
b) Unilateral Decision-making
c) Informed and timely decisions
d) Lack of responsibility

36. Why is Empathy important in leadership :
- It encourages a competitive work environment
 - It fosters teamwork and mutual understand
 - It prioritizes individual achievements
 - It promotes authoritarian control
37. Which factor is essential for sustaining innovation over time:
- Strict hierarchy
 - Resistance to change
 - Continuous learning and adaptability
 - Avoidance of Risk
38. What is a key driver innovation in workplace:
- Rigid thinking
 - Status quo
 - Creativity
 - Micro Management
39. Which leadership style is conducive to fostering innovation:
- Autocratic
 - Laissez – Faire
 - Transactional
 - Transformational
40. Which conflict resolution strategy involves finding a compromise acceptable to all parties:
- Avoidance
 - Accommodation
 - Collaboration
 - Competition
41. In a case bases group discussion, participants typically:
- share personal experiences
 - Analyze and discuss a specific scenario
 - Engage in role-playing
 - Debate on general topics
42. Effective time management in a group discussion involves:
- Ignoring time constraints
 - Allocating time wisely
 - Procrastinating on key points
 - Disregarding the agenda
43. Active listening in a group discussion includes:
- Interrupting others frequently
 - Demonstrating understanding through non verbal cues
 - Ignoring other participants
 - Avoiding eye contact
44. A key “do” in a group discussion is:
- Interrupting others
 - Dominating the conversation
 - Respecting others opinions
 - Avoiding active participation
45. What is a characteristic of a formal group discussion :
- Spontaneous occurrence
 - Unstructured format
 - Academic and Professional setting
 - Lack of specific topic
46. Which type of GD involves analyzing and discussing a specific case or scenario:
- Formal GD
 - Case-base GD
 - Focused GD
 - Role-playing GD
47. A positive attitude in a group discussion involves:
- Rejecting diverse view points
 - Embracing novel ideas
 - Dominating the conversation
 - Ignoring contributions of others
48. Which process is associated with creativity:
- Convergent thinking
 - Divergent thinking
 - Logical reasoning
 - Memorization
49. What is innovation:
- The generation of novel ideas
 - The implementation of creative solutions
 - Conforming to existing norms
 - Avoiding changes
50. Cognitive skills involve:
- Physical abilities
 - Mental processes
 - Quantifying creativity
 - Emotional Intellig

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BCV306C

Third Semester B.E./B.Tech. Degree Examination, Dec.2023/Jan.2024 Sustainable Design Concept for Building Services

Time: 3 hrs.

Max. Marks: 100

*Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.*

Module – 1			M	L	C
Q.1	a.	Define climate change. Describe the factors influencing the climate change.	10	L1	CO1
	b.	What is sustainable development? Explain the core elements of sustainable development.	10	L2	CO1
OR					
Q.2	a.	What is primary and secondary energy? Describe renewable and non-renewable resources.	10	L2	CO1
	b.	Define carbon footprint. Explain different types of carbon foot print.	10	L1	CO1
Module – 2					
Q.3	a.	List the major indoor air pollutants and explain its effects on human health.	10	L1	CO2
	b.	Illustrate the heat gain through the various building elements.	10	L2	CO2
OR					
Q.4	a.	Discuss the green design strategies to create visual comfort.	10	L2	CO2
	b.	Define Acoustics. Mention the characteristics of sound and principles of acoustics.	10	L1	CO2
Module – 3					
Q.5	a.	What is the concept of building envelope? Explain the energy efficiency in building envelope.	10	L2	CO3
	b.	Illustrate the salient features and scope of ECBC 2017.	10	L3	CO3
OR					
Q.6	a.	Explain Energy Audit. Describe different types of energy audit.	10	L2	CO4
	b.	What is water efficiency? Illustrate the technologies that can be implemented for the efficient use of water.	10	L3	CO4
Module – 4					
Q.7	a.	List and explain the features of sustainable building materials.	10	L2	CO4
	b.	Interpret the principles and benefits of lean construction.	10	L4	CO4
OR					
Q.8	a.	What is Life Cycle Assessment? Discuss its types.	10	L2	CO4
	b.	Illustrate the different phases of Green Building Project Management.	10	L4	CO4
Module – 5					
Q.9	a.	What is a Green Building Rating System? Illustrate its tangible and intangible benefits.	10	L3	CO5
	b.	Interpret the major categories assessed within BREEAM rating system.	10	L4	CO5
OR					
Q.10	a.	Differentiate between two Indian Green Building rating systems.	10	L3	CO5
	b.	Illustrate the principles of green design.	10	L4	CO5

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18CV42

Fourth Semester B.E. Degree Examination, Dec.2023/Jan.2024 Analysis of Determinate Structures

Time: 3 hrs.

Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
 2. Assume any missing data suitably.

Module-1

- 1 Draw the Influence Line Diagram (ILD) for a simply supported beam for the below cases:
 - a. ILD for reaction R_A
 - b. ILD for reaction R_B
 - c. ILD for shear force at 'C'
 - d. ILD for moment M_c at 'C'

Refer Fig.Q1. Load is moving from 'A' to 'B'.

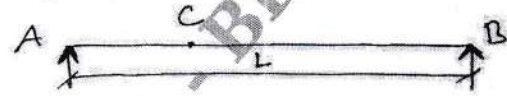


Fig.Q1

(20 Marks)

OR

- 2 Determine the maximum forces in the members U_2L_2 , U_3L_3 and U_2U_3 of the truss shown in Fig.Q2, when an uniformly distributed load of 60 kN/m, longer than the span, moves from left to right on top chord. Draw the influence line diagram only.

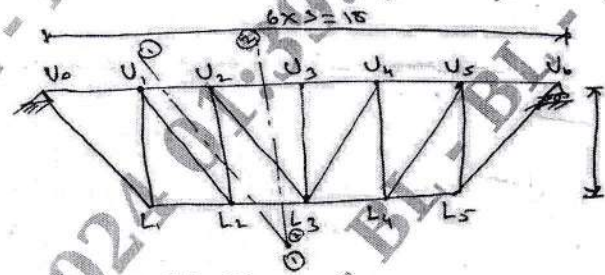


Fig.Q2

(20 Marks)

Module-2

- 3 Simply supported beam as shown in Fig.Q3 is subjected to a set of four concentrated loads which move from left to right. Determine
 - a. Absolute maximum shear in the beam
 - b. Absolute maximum moment in the beam

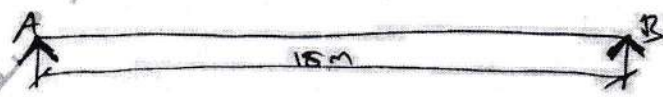
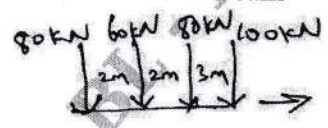


Fig.Q3

Also, draw the Influence line diagram.

(20 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
 2. Any revealing of identification, appeal to evaluator and/or equations written eg, 42+8 = 50, will be treated as malpractice.

OR

- 4 Determine the maximum forces in the members U_2U_3 , L_3U_3 and L_3L_4 of the bridge truss shown in Fig.Q4. If uniformly distributed load of 60 kN/m , longer than the span, traverse along the bottom chord members.

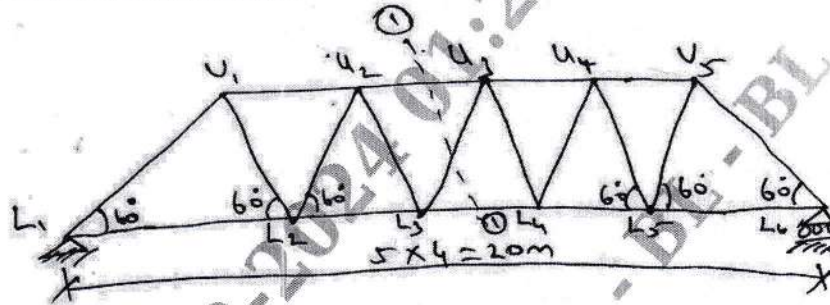


Fig.Q4

(20 Marks)

Module-3

- 5 Determine the slope and deflection at the free end of a cantilever beam as shown in Fig.Q5 by moment area method. Take $EI = 4000 \text{ kN/m}^2$.

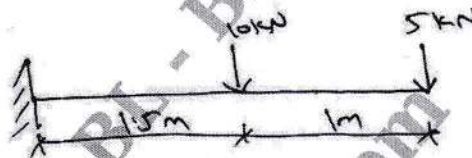


Fig.Q5

(20 Marks)

OR

- 6 Determine θ_A , θ_B , θ_C and deflection Δ_C in the beam shown in Fig.Q6 by conjugate beam method.

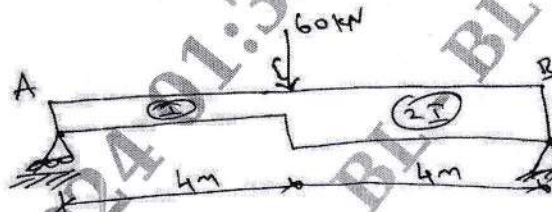


Fig.Q6

(20 Marks)

Module-4

- 7 Determine the vertical deflection of point 'C' in the frame shown in Fig.Q7. Given $E = 200 \text{ kN/mm}^2$ and $I = 30 \times 10^6 \text{ mm}^4$ by strain energy method.

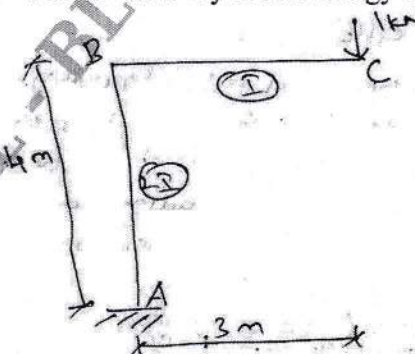


Fig.Q7

(20 Marks)

OR

- 8 A simply supported beam of span 'L' carries a concentrated load 'P' at a distance 'a' from left hand side support as shown in Fig.Q8. Using Castiglione's theorem determine the deflection under the load. Assume uniform flexural rigidity.

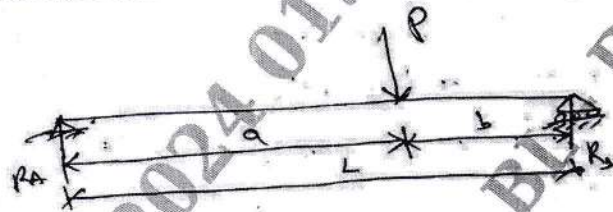
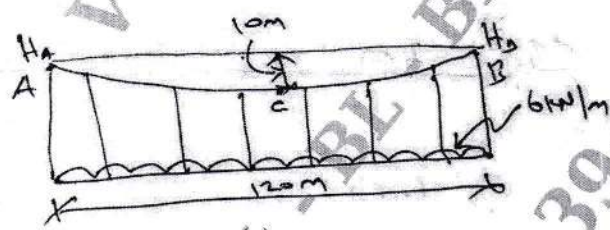


Fig.Q8

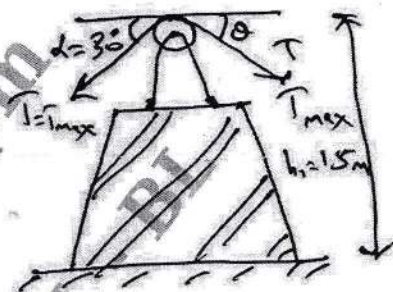
(20 Marks)

Module-5

- 9 A cable of span 120m and dip 10m carries a load of 6 kN/m of horizontal span. Find the maximum tension in the cable and the inclination of the cable at the support. Find the forces transmitted to the supporting pier if the cable passes over smooth pulleys on top of the pier. The anchor cable is at 30° to the horizontal. Determine the maximum bending for the pier if the height of the pier is 15m [Fig.Q9]



(a)



(b)

Fig.Q9

(20 Marks)

OR

- 10 A three hinged parabolic arch hinged at the supports and at the crown has a span of 24m and a central rise of 4m. It carries a concentrated load of 50 kN at 18m from left support and uniformly distributed load of 30 kN/m over the left half portion. Determine the moment, thrust and radial shear at a section 6m from the left support. [Refer Fig.Q10]

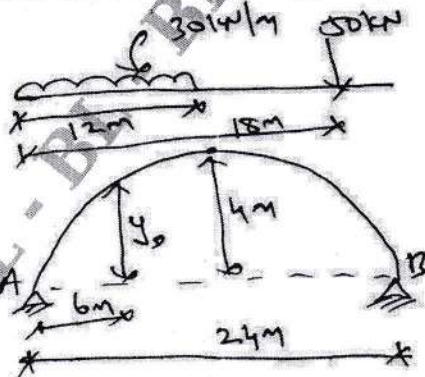


Fig.Q10

(20 Marks)

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Fourth Semester B.E. Degree Examination, Dec.2023/Jan.2024 Applied Hydraulics

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1. a. What is dimensional analysis? List the uses of dimensional analysis. (04 Marks)
- b. The pressure drop ' ΔP ' in a pipe of diameter D and length l depends on mass density ρ and viscosity μ of the flowing fluid, mean velocity of flow V and average height K of roughness projections on the pipe surface. Obtain a dimensionless expression for ΔP . Hence show that

$$h_f = \frac{f l V^2}{2gD} \quad (10 \text{ Marks})$$
- c. Explain detail the stability of submerged and floating bodies. (06 Marks)

OR

2. a. A solid cylinder of diameter 4.0m has a height of 3metres. Find the meta centric height of the cylinder when it is floating in water with its axis vertical. The specific gravity of the cylinder = 0.6. (08 Marks)
- b. A 1:10 scale model of a submarine moving far below the surface of water is tested in a wind tunnel. If the speed of the prototype is 8m/sec, determine the corresponding velocity of water in the tunnel. Also determine the ratio of the drag for the model and prototype. Kinematic viscosity $\gamma_{\text{seawater}} = 1.121 \times 10^{-6} \text{ m}^2/\text{sec}$, $\gamma_{\text{water}} = 1 \times 10^{-6} \text{ m}^2/\text{sec}$, $\rho_{\text{seawater}} = 1027\text{kg/m}^3$, $\rho_{\text{water}} = 1000\text{kg/m}^3$. (08 Marks)
- c. List and explain the selection of repeating variables in Buckingham's Pi theorem of dimensional analysis. (04 Marks)

Module-2

3. a. What is a most economical channel section? With usual notations derive the conditions for a most economical trapezoidal channel section. (06 Marks)
- b. Explain briefly classification of flow in channel sections. (05 Marks)
- c. Water flows in a trapezoidal channel having bottom width 6m, side slopes 2 horizontal to 1 vertical. If it has to carry a discharge of $65\text{m}^3/\text{sec}$, compute the bottom slope required to be provided. Taking Mannings $\eta = 0.025$, depth of flow = 2m. (09 Marks)

OR

4. a. An irrigation channel of trapezoidal section, having side slopes 3 horizontal to 2 vertical is to carry a flow of $10\text{m}^3/\text{sec}$ on a longitudinal slope of 1 in 5000. The channel is to be lined for which the value of friction coefficient in Mannings formula is $\eta = 0.012$. Find the dimensions of the most economic section of the channel. (09 Marks)
- b. Draw a neat specific energy curve in a flow in a channel section. Mark and explain the salient points in it. (06 Marks)
- c. Show that for flow in a rectangular channel section, at critical conditions $y_c = \frac{2}{3} E$, where y_c is the critical depth and E is the energy of flow at critical depth. (05 Marks)

Module-3

- 5 a. With usual notations derive an expression for hydraulic jump in rectangular channels in terms of Froude's number. (09 Marks)
- b. The depth of flow of water, at a certain section of a rectangular channel of 2m width is 0.3m. The discharge through the channel is $1.5\text{m}^3/\text{sec}$. Determine whether a hydraulic jump will occur, and if so, find the height and loss of energy per kg of water. (06 Marks)
- c. Describe briefly the water curves for a mild and steep slopes. (05 Marks)

OR

- 6 a. A rectangular channel 7.5m wide has a uniform depth of flow of 2m and has a bed slope of 1 in 3000. If due to weir constructed at the downstream end of the channels water surface at a section is raised by 0.75m, determine the water surface slope with respect to horizontal at this section. Assume Mannings $n = 0.02$. (08 Marks)
- b. With usual notations derive an expression for a length of back water curve, in a channel section. (06 Marks)
- c. Explain in brief different types of hydraulic jump. What are the applications of hydraulic jump? (06 Marks)

Module-4

- 7 a. Give a brief description of impulse momentum equation and what are the practical applications of impulse momentum equation. (04 Marks)
- b. With usual notations prove that the maximum efficiency of a jet striking a series of moving flat vanes fixed on the periphery of the wheel is 50%. (06 Marks)
- c. With a neat sketch, explain the general layout of a hydraulic power plants. Explain different types of efficiencies of hydro electric turbines. (10 Marks)

OR

- 8 a. Give a brief account on classification of turbines based on different criteria. (06 Marks)
- b. A Pelton wheel has to be designed for the following data. Power to be developed = 6000kW. Net head available = 300m, speed = 500rpm. Ratio of jet diameter to wheel diameter = $\frac{1}{10}$ and overall efficiency = 85%. Find the number of jets, diameter of the jet, diameter of the wheel and quantity of water required. (08 Marks)
- c. With a neat diagram, explain different components of Pelton wheel. With the help of velocity triangle find the expression for efficiency of Pelton wheel. (06 Marks)

Module-5

- 9 a. Design a Francis turbine runner with the following data. Net head $H = 68\text{m}$, speed $N = 750\text{ rpm}$, output power $P = 330\text{kW}$, $\eta_h = 94\%$, $\eta_0 = 85\%$, flow ratio $\psi = 0.15$, breadth ratio $n = 0.1$ inner diameter of runner is $\left(\frac{1}{2}\right)$ outer diameter. Also assume 6% of circumferential area of the runner to be occupied by the thickness of the vanes. Velocity of flow remains constant throughout and flow is radial at exit. (08 Marks)
- b. Explain the functions of draft tube in reaction turbines. What are its different types explain with diagrams. (04 Marks)
- c. A Kaplan turbine develops 24647.6kW power at an average head of 39 metres. Assuming a speed ratio of 2, flow ratio of 0.6, diameter of the boss equal to 0.35 times the diameter of the runner and an overall efficiency of 90%, calculate the diameter, speed the turbine. (08 Marks)

OR

- 10 a. With neat diagram, explain the component and working of centrifugal pumps. (06 Marks)
- b. With a neat diagram, derive an expression for minimum starting speed of centrifugal pumps with usual notations. (04 Marks)
- c. A centrifugal pump is running at 1000rpm. The outer vane angle of the impeller is 45° and velocity of flow at outlet is 2.5m/sec. The discharge through the pump is 200 litres/sec. When the pump is working against a total head of 20m. If the manometric efficiency of the pump is 80% determine:
- The diameter of the impeller
 - The width of the impeller at outlet.

(10 Marks)

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Fourth Semester B.E. Degree Examination, Dec.2023/Jan.2024 Concrete Technology

Time: 3 hrs.

Max. Marks: 100

- Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. Use of IS-10262 – 2019 is permitted.
3. Use of IS-456 is permitted.*

Module-1

- 1 a. Explain the manufacture process of cement by dry process using flow chart. (10 Marks)
b. Explain the constituents of cement with their percentage and functions. (10 Marks)

OR

- 2 a. What is an Admixture? What are the effects of air entrainment and retarders on the properties of concrete? (10 Marks)
b. What are the different types of coarse aggregate tests? Explain any two type of aggregate tests with neat sketch and appropriate formulas used. (10 Marks)

Module-2

- 3 a. Explain two laboratory tests for measurement of workability. (10 Marks)
b. What is the importance of curing in concrete? Briefly discuss any two methods. (10 Marks)

OR

- 4 a. Explain the manufacturing process of concrete. (12 Marks)
b. Explain segregation and bleeding of concrete. (08 Marks)

Module-3

- 5 a. Explain the types of shrinkage in concrete. (08 Marks)
b. Discuss the factors affecting strength of concrete. (12 Marks)

OR

- 6 a. What are the internal and external factors influence the durability of concrete? (10 Marks)
b. Explain the rebound hammer test and ultrasonic pulse velocity test. (10 Marks)

Module-4

- 7 a. Write the steps involved in the methods of mix design. (12 Marks)
b. Explain the concept of mix design. (08 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

OR

- 8 Design a concrete mix for M_{40}
- i) Grade designation : M_{40}
 - ii) Type of cement : PPC
 - iii) Max Nominal size of aggregate 20mm down size
 - iv) Min cement content and max water-cement ratio to be adopted and/or : severe (for reinforced concrete). Exposure conditions as per table 3 and table 5 of IS456.
 - v) Workability : 75mm (slump)
 - vi) Method of concrete placing : chute (non pumpable)
 - vii) Degree of site control : Good
 - viii) Type of aggregate : crushed angular aggregate
 - ix) Maximum cement content not : 450 kg/m^3 including fly ash
 - x) Chemical admixture type : super plasticizer – normal
 - xi) Fine aggregate zone : zone 2
- I. Cement : Type of cement : PPC conforming to IS1489 (part 1) specific gravity : 2.88
 - II. Coarse aggregate : specific gravity : 2.74 water absorption : 0.5%
 - III. Fine aggregate : specific gravity : 2.65 water absorption : 1%
 - IV. Chemical admixture : super plasticizer conforming IS9103 specific gravity : 1.145
- (20 Marks)

Module-5

- 9 a. Explain the test conducted on self compacting concrete. (12 Marks)
 b. List the advantages and disadvantages of RMC. (08 Marks)

OR

- 10 a. List the types of fibers used in FRC. Discuss properties of FRC and application of FRC. (12 Marks)
 b. What is light weight concrete? Discuss the use and advantages of light weight concrete. (08 Marks)

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Fourth Semester B.E. Degree Examination, Dec.2023/Jan.2024 Advanced Surveying

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- 1 a. Explain steps involved in temporary adjustment of setting out theodolite. (08 Marks)
- b. In order to ascertain the elevation of top (Q) of the signal on a hill, observations were made from two instrument stations P and R being in line with Q. The angle of elevation of Q at P and R were $28^{\circ} 42'$ and $18^{\circ} 6'$ respectively. The staff readings upon the bench mark of elevation 287.28 were respectively 2.870 and 3.750 when the instrument was at P and R, the telescope being horizontal. Determine the elevation of the foot of the signal if the height of the signal above its base is 3 meters. Do checks. (12 Marks)

OR

- 2 a. Explain the measurement of horizontal angle by repetition method. List the errors eliminated in this method. (08 Marks)
- b. To find the elevation of the top(Q) of a hill, a flag staff of 2 m height was erected and observation were made from two stations P and R, 60 m apart. The horizontal angle measured at P between R and top of flag-staff was $60^{\circ} 30'$ and that measured at R between P and top of the flag staff was $60^{\circ} 18'$. The angle of elevation to the top of flag staff P was measured to be $10^{\circ} 12'$ at P. The angle of elevation to the top of flag staff was $10^{\circ} 48'$ at R. Staff readings on B.M., when the instrument was at, (i) P = 1.965, R = 2.055 m. Calculate elevation of the top of the hill if that of BM was 435.065 m. Do checks. (12 Marks)

Module-2

- 3 a. Mention different system of tacheometric survey. Explain any one system. (10 Marks)
- b. What are the classifications of triangulation system? Explain any one. (10 Marks)

OR

- 4 a. What are the selection criteria for selecting base line and stations? (10 Marks)
- b. A tacheometer was set up at a station A and the readings on a vertically held staff at B were 2.255, 2.605, 2.955, the line of sight being at an inclination of $8^{\circ} 24'$. Another observation on the vertically held staff at BM gave the readings 1.64, 1.920, 2.200 the inclination of the line of sight being $1^{\circ} 6'$. Calculate the horizontal distance between A and B and the elevation of B if RL if BM is 418.685 m. The constants of the instruments were 100 and 0.3. (10 Marks)

Module-3

- 5 a. Explain the following terms :
- (iii) Back tangent (ii) Mid-ordinate (iii) Intersection angle.
- (iv) Left hand curve (v) Point of tangent (10 Marks)
- b. Calculate the ordinates at 10 m distance for a circular curve having a long chord of 80 m and versed sine of 4 meters. (10 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and/or equations written eg, $42+8 = 50$, will be treated as malpractice.

OR

- 6 a. With a neat sketch, explain following parts of compound curve :
- (i) Radius of small curve.
 - (ii) Common tangent
 - (iii) Point of compound curvature.
 - (iv) Point of curve
 - (v) Point of intersection
- (10 Marks)
- b. With a neat sketch, explain various types of vertical curves. (10 Marks)

Module-4

- 7 a. Define the following terms :
- (i) Principal point
 - (ii) Camera axis.
 - (iii) Tilted photograph.
 - (iv) Flying height.
 - (v) Exposure station
- (10 Marks)
- b. A camera having focal length of 20 cm is used to take a vertical photograph of terrain having an average elevation of 1500 m. What is the height above sea level at which an aircraft must fly in order to get a scale of 1 : 8000? (10 Marks)

OR

- 8 a. With a neat sketch, explain scale of a vertical photograph. Also derive a equation for scale of a vertical photograph. (10 Marks)
- b. A section line AB appears to be 10.16 cm on a photograph for which the focal length is 16 cm. The corresponding line measures 2.54 cm on a map, which is to a scale of 1 in 50,000. The terrain has an average elevation of 200 m above MSL. Calculate flying altitude of aircraft above MSL, when the photograph was taken. (10 Marks)

Module-5

- 9 a. What are the different types of EDM instruments? Explain any one briefly. (10 Marks)
- b. What is GPS? Explain the working principle of GPS and its uses in surveying. (10 Marks)

OR

- 10 a. What is GIS? List the application of GIS in Civil Engineering. (10 Marks)
- b. Explain the working principle and applications of total station. (10 Marks)

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Fourth Semester B.E. Degree Examination, Dec.2023/Jan.2024 Water Supply and Treatment Engineering

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- 1 a. Explain the importance and need for protected water supply. (10 Marks)
- b. Solve the problem using Geometric Increase method. Find the population in 2020, 2030 and 2040. (10 Marks)

Year	1970	1980	1990	2000	2010
Population	1,01,000	1,10,000	1,22,000	1,36,000	1,53,000

OR

- 2 a. What is Peak factor? Explain the factors governing design period. (10 Marks)
- b. What is Five demands? Mention the different formulas used to calculate five demands. (10 Marks)

Module-2

- 3 a. Briefly explain the objectives of water treatment and list the physical water quality characteristics. (10 Marks)
- b. Discuss the complete sequence of water treatment with a flow diagram. (10 Marks)

OR

- 4 a. Briefly explain the membrane filter technique for bacteria logical examination of water. (10 Marks)
- b. Write the permissible limits and effects of following water quality parameters according (IS10500 – 1991) :
 i) pH ii) Hardness iii) Turbidity iv) Chloride v) Fluoride. (10 Marks)

Module-3

- 5 a. Define Sedimentation and Coagulation. List the common coagulants used and mention the factors affecting coagulants. (10 Marks)
- b. About 15000m³/day of water, flocculating particles were produced by coagulation and a column analysis indicates that an overflow rate of 20m/day will produce satisfactory at the depth of 3.5m. Determine the size of required settling tank. (10 Marks)

OR

- 6 a. Briefly explain the mechanism of filtration. (10 Marks)
- b. Design the approximate dimensions of a set of rapid gravity filters for treating water required for a population of 50,000, the rate of water supply being 180ℓ/d/person. The filters are works to 5000 ℓ/hr/m². Assume necessary data. (10 Marks)

Module-4

- 7 a. Define Chlorination. Explain the various types of chlorination. (10 Marks)
- b. Define Fluoridation and Defluoridation. Briefly explain Nalgonda technique (10 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg. 42+8 = 50, will be treated as malpractice.

OR

- 8 a. What is Softening of water? Discuss the Zeo – lite process of water softening with neat sketch. (10 Marks)
- b. Discuss the characteristics of ideal disinfectants and explain the mechanism of disinfectant. (10 Marks)

Module-5

- 9 a. Briefly explain the necessity and factors for the selection of a pump. (10 Marks)
- b. Determine the capacity of pump required for following data :
- Population = 3 lakhs
Water level in the source = 100m
Daily demand of water = 140 lpcd
Level of treatment plant = 125m
Pumping hours = 24 hrs a day
Diameter of rising main = 90cm
Distance between source and treatment = 2km
Co-efficient of friction = 0.01. (10 Marks)

OR

- 10 a. With the help of neat sketch, discuss the Dead – End system and Radial system of water supply. (10 Marks)
- b. Briefly explain the following :
- i) Reflux valve ii) Fire hydrant. (10 Marks)

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18MAT41

Fourth Semester B.E. Degree Examination, Dec.2023/Jan.2024 Complex Analysis, Probability and Statistical Methods

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- State and prove Cauchy – Riemann equations in Cartesian form. (07 Marks)
 - Find the analytic function $f(z) = u + iv$, given that $u - v = e^x[\cos y - \sin y]$. (07 Marks)
 - If $y(z)$ is an analytic function, then show that :
$$\left\{ \frac{\partial}{\partial x} |f(z)| \right\}^2 + \left\{ \frac{\partial}{\partial y} |f(z)| \right\}^2 = |f'(z)|^2 .$$
 (06 Marks)

OR

- Determine the analytic function $f(z)$, where imaginary part is $\left(\gamma - \frac{K^2}{\gamma} \right) \sin \theta$, $r \neq 0$. Hence find the real part of $f(z)$. (07 Marks)
 - Find the analytic function $f(z)$, whose real part is $u = \log \sqrt{x^2 + y^2}$. (07 Marks)
 - Show that $f(z) = z^u$ is analytic and hence find its derivative. (06 Marks)

Module-2

- Discuss the transformation $w = z^2$. (07 Marks)
 - State and prove Cauchy's integral theorem. (07 Marks)
 - Evaluate : $\int_0^{(2+i)} (\bar{z})^2 dz$, along the real axis up to 2 and then vertically to $2 + i$. (06 Marks)

OR

- Evaluate : $\int_c \frac{\sin \pi z^2 + \cos \pi z^2}{(z-1)(z+2)} dz$ where c is the circle $|z| = 3$. (07 Marks)
 - Find the bilinear transformation that maps the points $z = 1, i, -1$ onto $w = 0, 1, \infty$. (07 Marks)
 - Evaluate : $\int_{(1-i)}^{(2+i)} (2x + iy + 1) dz$ along the straight line joining the points $(1, -1)$ and $(2, 1)$. (06 Marks)

Module-3

- A coin is tossed twice. If x represents the number of heads turning up, find the probability distribution of x . also find its mean and variance. (07 Marks)
 - If 2% of the fuses manufactured by a firm are defective. Find the probability that a box containing 200 fuses contains : i) no defective fuses ii) 3 or more defective fuses. (07 Marks)
 - In a normal distribution, 31% of the items are below 45 and 8% of the items are above 64. Find the mean and standard deviation of the distribution. Given that :
 $A(1.4) = 0.42$ and $A(0.5) = 0.1915$. (06 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg. 42+8 = 50, will be treated as malpractice.

OR

- 6 a. Find the constant K such that

$$f(x) = \begin{cases} Kx^2; & -3 \leq x \leq 3 \\ 0; & \text{otherwise} \end{cases}$$

is a probability density function. Also find :

- i) $P(1 \leq x \leq 2)$
 ii) $P(x \leq 2)$
 iii) $P(x > 1)$. (07 Marks)
- b. When a coin is tossed 4 items, find the probability of getting
 i) exactly one head
 ii) at most 3 heads
 iii) at least 2 heads. (07 Marks)
- c. If x is an exponential variate with mean 5. Evaluate :
 i) $P(0 < x <)$
 ii) $P(-\infty < x < 10)$
 iii) $P(x \leq 0)$ or $(x \geq 1)$. (06 Marks)

Module-4

- 7 a. Find the coefficient of correlation and the lines of regression for the following data :

x	1	2	3	4	5
y	2	5	3	8	7

- b. Fit a curve of the form
- $y = ax^b$
- for the data: (07 Marks)

x	1	2	3	4	5
y	0.5	2	4.5	8	12.5

- c. If the equations of regression lines of two variables x and y are $x = 19.13 - 0.879$ and $y = 11.64 - 0.5x$. Find the correlation coefficient and the means of x and y. (07 Marks)
- (06 Marks)

OR

- 8 a. Compute the rank correlation coefficient for the following data :

x	68	64	75	50	64	80	75	40	55	64
y	62	58	68	45	81	60	68	48	50	70

- b. Fit a parabola
- $y = a + bx + cx^2$
- by the method of least squares to the following data : (07 Marks)

x	1	2	3	4	5	6	7
y	2.3	5.2	9.7	16.5	29.4	35.5	54.4

- c. Compute the mean values of x and y and the coefficient correlation for the regression lines $2x + 3y + 1 = 0$ and $x + 6y - 4 = 0$. (07 Marks)
- (06 Marks)

Module-5

- 9 a. The joint probability distribution of two random variables x and y is defined by the function $P(x, y) = \frac{1}{27}(2x + y)$, where x and y assume the values 0, 1, 2. Find the marginal distributions of x and y . Also compute $E(x)$ and $E(y)$. (07 Marks)
- b. Fit a Poisson distribution for the following data and test the goodness of fit. Given that $\chi^2_{0.05} = 9.49$ for degrees of freedom 4. (07 Marks)
- c. Write short notes on :
 i) Null hypothesis
 ii) Type - I and Type - II
 iii) Level of significance. (06 Marks)

OR

- 10 a. Joint probability distribution of two random variables is given by the following data :

$y \backslash x$	-3	2	4
1	0.1	0.2	0.2
3	0.3	0.1	0.1

- Find :
- i) Marginal distributions of x and y
 ii) $Cov(x, y)$
 iii) $P(x, y)$. (07 Marks)
- b. The following are the I-Q's of a randomly chosen sample of 10 boys.
 70, 120, 110, 101, 88, 83, 95, 98, 107, 100
 Does this data support the hypothesis that the population mean of I-Q's is 100 at 5% level of significance? Given $t_{0.05} = 2.26$. (07 Marks)
- c. A sample of 900 items is found to have the mean 3.4. Can it be reasonably regarded as a truly random sample from a large population with mean 3.25 and standard deviation 1.61 at 5% level of significance? Given $Z_{0.05} = 1.96$ (Two Tailed Test). (06 Marks)

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21CV42

Fourth Semester B.E. Degree Examination, Dec.2023/Jan.2024

Fluid Mechanics and Hydraulics

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- 1 a. Define the following fluid properties and mention their SI units : i) Specific weight
ii) Kinematic viscosity iii) Surface tension. (06 Marks)
- b. Define Capillarity of a liquid. Derive an expression for the capillary rise of a liquid. (06 Marks)
- c. A cube of 0.25m side and mass 28kg slides down a plane inclined at 2 vertical : 3 Horizontal covered by a thin film of oil of viscosity 2.2×10^{-3} N-S/m². If the thickness of the film is 0.02mm, determine the steady state velocity of the block. (08 Marks)

OR

- 2 a. Derive an expression for total pressure and centre of pressure for an immersed vertical plane surface. (06 Marks)
- b. State the prove Pascal's law of pressure. (06 Marks)
- c. A differential manometer is connected at two points A and B as shown in Fig. Q2(c). At B, the air pressure is 9.81N/cm² (absolute). Find the absolute pressure at A. (08 Marks)

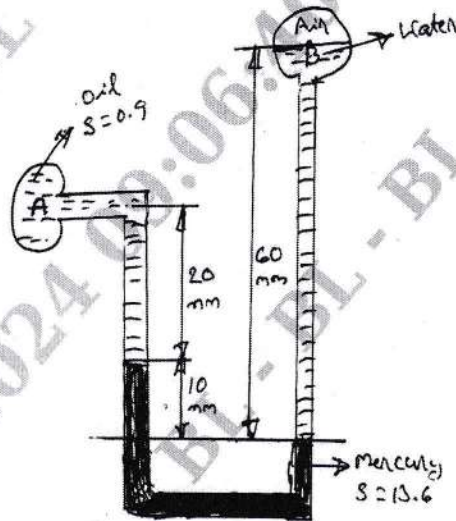


Fig. Q2(c)

Module-2

- 3 a. Derive Euler's equation of motion along a stream line. Obtain Bernoulli's equation from Euler's equation. Mention the assumptions made. (10 Marks)
- b. A pipe 300m long has a slope of 1 : 100 and tapers from 1m diameter at the higher end to 0.5m at the lower end. The quantity of water flowing is 0.9m³/s. If the pressure at the higher end is 70kPa , find the pressure in kPa at the lower end. (10 Marks)

OR

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

- 4 a. Derive the three dimensional continuity equations for a steady, incompressible fluid flow. (08 Marks)
- b. Derive an expression for discharge through a venturimeter with usual notations. (08 Marks)
- c. Mention the reasons for the following :
- The coefficient of discharge of a venturimeter is always greater than that of an orifice orifice.
 - The divergent portion of a venturimeter is made longer than the convergent cone. (04 Marks)

Module-3

- 5 a. Explain the classification of Notches and Weirs. (04 Marks)
- b. Derive an expression for discharge through a rectangular notch with usual notations. (06 Marks)
- c. The head of water over a circular shape vertical orifice of diameter 100mm is 10m. The water coming out from the orifice is collected in a circular measuring tank of diameter 1.5m. The time recorded for 1m rise of water in the measuring tank is 25 seconds. The coordinates of the jet measured from the Vena – contract are 4.3m horizontal and 0.5m vertical. Determine the hydraulic coefficients of the orifice. (10 Marks)

OR

- 6 a. Explain the experimental method of determination of the three hydraulic coefficients of a small circular vertical orifice discharging water from a tank if the head over the orifice is H. (08 Marks)
- b. Determine the discharge through a trapezoidal notch which is 1m wide at top and 0.4m at the bottom. The head of water above the sill level is 0.2m and the total height of the notch is 0.3m. Consider the coefficient of discharge for the rectangular portion as 0.62 and for triangular portion as 0.6. (06 Marks)
- c. Determine the head loss due to friction in a pipe of diameter 300mm and length 50m through which water is flowing at a velocity of 3m/s. Use Darcy – Weirsbach equation. Take kinematic viscosity of water as 0.01 stokes. (06 Marks)

Module-4

- 7 a. Explain the classification of flows in open channels with necessary conditions. (06 Marks)
- b. A rectangular channel carries water at the rate of 400 litres/s with the bed slope maintained at 1 vertical : 2000 horizontal. Find the most economical dimensions of the channel if the Chezy's constant = 50. (08 Marks)
- c. Determine the specific energy of flowing water through a rectangular channel of width 5m having a discharge of $10\text{m}^3/\text{s}$ and depth of flow of 3m. (06 Marks)

OR

- 8 a. Explain the concept of hydraulic jump with the aid of a neat sketch. Write the expression for evaluating the depth of the hydraulic jump. (05 Marks)
- b. Determine the critical depth and critical velocity of water flowing through a rectangular channel of width 8m carrying a discharge of $15\text{m}^3/\text{s}$. (05 Marks)
- c. Determine the slope of the bed of the circular channel for maximum velocity condition. The diameter of the channel is 0.6m through which water is flowing at a rate of 150 litres/s. Take Chezy's constant = 60. (10 Marks)

Module-5

- 9 a. Derive an expression for the force exerted by a jet striking a moving symmetrical curved lane at the centre and hence show that the maximum efficiency of this jet – lane system is limited to $\frac{16}{27}$. (10 Marks)
- b. Explain the classification of hydraulic turbines and define the different efficiencies of the same. (10 Marks)
- OR**
- 10 a. With the help of a neat sketch, explain the function of different parts of a Francis inward flow reaction turbine. (10 Marks)
- b. A centrifugal pump is to deliver $0.12\text{m}^3/\text{s}$ of water at a speed of 1450 rpm against a head of 25m. The impeller diameter is 250mm and the width at outlet is 50mm. the manometric efficiency is 75%. Determine the vane angle at the outer periphery of the impeller. (10 Marks)

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21CV43

Fourth Semester B.E. Degree Examination, Dec.2023/Jan.2024 Public Health Engineering

Time: 3 hrs.

Max. Marks: 100

- Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. Assume any missing data suitably.*

Module-1

- 1 a. Define Per Capita demand. Explain the factors affecting the same. (08 Marks)
b. What is Fire demand? Compute fire demand for a city having population 1,40,000 using various formulas. (06 Marks)
c. Write short notes on : (06 Marks)
i) Need for protected water supply ii) Variation in water demand

OR

- 2 a. What is design period? Discuss the factors affecting the design period of water supply projects. (06 Marks)
b. The following data are available for a town. Estimate the probable population in the year 2033, 2043 by Geometric Increase and Incremental Increase method.

Year	1993	2003	2013	2023
Population	80000	120000	168000	228000

- c. Give the maximum permissible limits as per BIS for the following parameters: (10 Marks)
i) Hardness ii) Fluoride iii) Turbidity iv) Nitrates. (04 Marks)

Module-2

- 3 a. With the help of flow diagram, explain the complete sequence of water treatment plant. (08 Marks)
b. Explain the types of settling in sedimentation tank. (06 Marks)
c. Determine the quantity of Alum required in order to treat 13 million litres of water per day at treatment plant where 12 PPM of alum dose is required. Also determine the amount of CO₂ gas which will be released/liter of water treated. Given molecular weight of Aluminium = 26, Sulphur = 32, Oxygen = 16, Hydrogen = 1, Carbon = 12. (06 Marks)

OR

- 4 a. What is filtration? Explain the theory of filtration. (06 Marks)
b. With a neat sketch explain the working of Rapid Sand filter. (07 Marks)
c. Design six slow sand filter beds from the following data:
Population 50,000 ; Per capita 150 LPCD ; Rate of filtration 180 L/H/m² , Length of each bed is equal to twice the breadth. Assume maximum demand as 1.8 times the average daily demand. Also assume 1 unit is kept stand by. (07 Marks)

Module-3

- 5 a. What is disinfection? What are the requirements of good disinfectants? What are the factors affecting the disinfection process. (06 Marks)
b. What is Chlorination? Explain different types of chlorination. (06 Marks)
c. What is softening? Explain lime soda process of hardness removal. (08 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

OR

- 6 a. Explain combined system and separate system of sewerage giving their merits and demerits. (08 Marks)
- b. Define sampling. Explain Grab, Composite, Integrated sampling. (04 Marks)
- c. The BOD of a sewage incubated for 5 days at 30°C has been found to be 110 mg/L. Calculate the BOD₅ at 20°C assuming $K_{(20)} = 0.1/\text{day}$. (08 Marks)

Module-4

- 7 a. Write the flow diagram employed for a conventional wastewater treatment plant. Indicate the importance of each unit. (08 Marks)
- b. With a neat sketch explain the working of
i) Screens ii) Grit Chamber. (12 Marks)

OR

- 8 a. What is meant by Activated Sludge process? Describe with sketch the treatment of sewage by Activated Sludge process. (10 Marks)
- b. List and explain the modifications of Activated Sludge process. (10 Marks)

Module-5

- 9 a. Explain with neat sketch the working of Trickling filter. (08 Marks)
- b. Explain with sketch the working of the following :
i) Bio – Towers
ii) Rotating Biological Contactors (RBC) (12 Marks)

OR

- 10 a. Explain with sketch the working of the following :
i) Sludge drying beds
ii) Oxidation ditch (10 Marks)
- b. Explain briefly the different stages of sludge digestion process in a digester. (10 Marks)

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21CV44

Fourth Semester B.E. Degree Examination, Dec.2023/Jan.2024 Analysis of Structures

Time: 3 hrs.

Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. Assume missing data, if any.

Module-1

- 1 a. State and prove Mohr's theorems for slope and deflection of prismatic beam. (10 Marks)
b. Find the slope and deflection at free end of the cantilever beam shown in Fig.Q1(b) by moment area method.

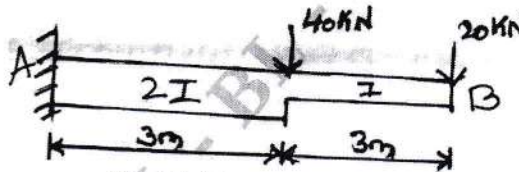


Fig.Q1(b)

(10 Marks)

OR

- 2 a. Calculate slope at support and deflection under the point load by conjugate beam method for beam shown in Fig.Q2(a).

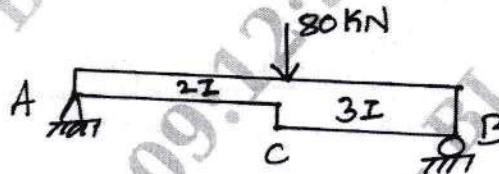


Fig.Q2(a)

(10 Marks)

- b. For a simply supported beam subjected to point loads at one third points. Calculate max slope and maximum deflection. (10 Marks)

Module-2

- 3 A truss is loaded as shown in Fig.Q3. The cross sectional area as indicated in figure. Find strain energy stored due to loading. Take $E = 72 \text{ GPa}$.

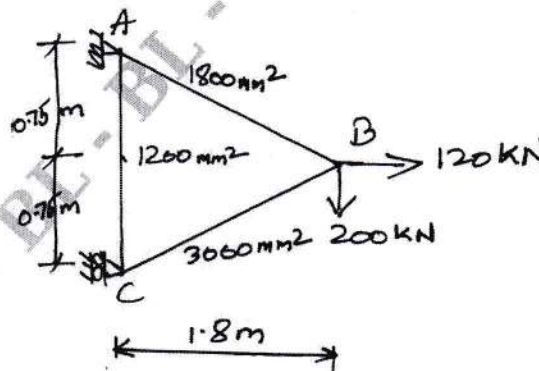


Fig.Q3

(20 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

OR

- 4 For the truss shown in Fig.Q4. The cross sectional area of each member is 400 mm^2 . Take $E = 200 \text{ GPa}$. Determine the vertical deflection at joint C if 4 kN force is applied to the truss at 'C'.

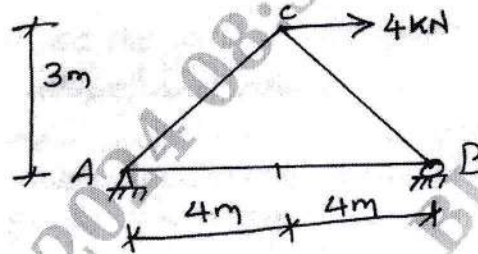


Fig.Q4

(20 Marks)

Module-3

- 5 A three hinged symmetrical parabolic arch has a span of 30 m and a central rise of 6 m. The arch carries a uniformly distributed load of intensity 30 kN/m over left half portion and a concentrated load of 60 kN at 9m from right had support. Compute the:
- Bending moment
 - Normal thrust
 - Radial shear at 9m from left support. Also draw the B.M.D.

(20 Marks)

OR

- 6 A suspension bridge of 120 m span has a central dip of 12 m and support a U.D.L. of 15 kN/m over the span. Calculate the maximum and minimum tension in cable, size of the cable if the permissible stress of the cable material is 200 N/mm^2 . The length of the cable and forces in the tower if the cable is passing over a smooth pulley. Take height of the tower $h = 20 \text{ m}$ and inclination of anchor cable = 25° .

(20 Marks)

Module-4

- 7 Analyze the continuous beam shown in Fig.Q7 by slope deflection method and draw bending moment, shear force diagram and elastic curve. Consider Young's modulus E to be same, throughout the beam.

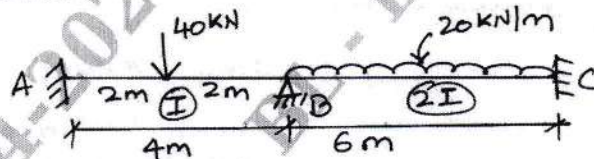


Fig.Q7

(20 Marks)

OR

- 8 Analyze the frame shown in Fig.Q8 by slope deflection method and draw bending moment diagram. $E = \text{constant}$.

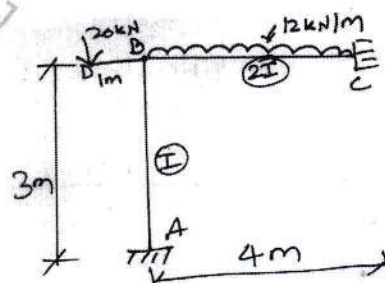


Fig.Q8

(20 Marks)

Module-5

- 9 Analyze the beam shown in Fig.Q9. By stiffness matrix method, take E same throughout the beam. Draw S.F.D and B.M.D.

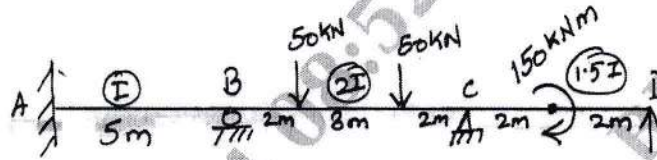


Fig.Q9

(20 Marks)

OR

- 10 Analyze the beam shown in Fig.Q10. By stiffness matrix method, the support B sinks by 10 mm. Take $E = 2047 \text{ kN/m}$, $I = 4162 \times 10^4 \text{ mm}^4$.

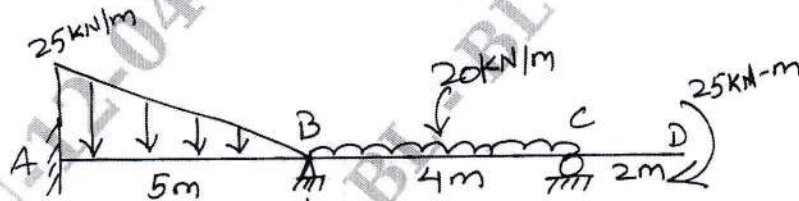


Fig.Q10

(20 Marks)

CBCS SCHEME

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Question Paper Version : A

Fourth Semester B.E. Degree Examination, Dec.2023/Jan.2024 Green Buildings

Time: 1 hr.]

[Max. Marks: 50

INSTRUCTIONS TO THE CANDIDATES

1. Answer all the **fifty** questions, each question carries one mark.
2. Use only **Black ball point pen** for writing / darkening the circles.
3. **For each question, after selecting your answer, darken the appropriate circle corresponding to the same question number on the OMR sheet.**
4. Darkening two circles for the same question makes the answer invalid.
5. **Damaging/overwriting, using whiteners** on the **OMR** sheets are strictly prohibited.

-
1. Gyprum is a
a) Mechanically formed sedimentary rock b) Igneous rock
c) Chemically precipitated sedimentary rock d) Metamorphic rock
 2. A stone suitable for masonry should be
a) Hard b) Tough c) Heavy d) Light
 3. Plywood has the advantage of
a) Greater tensile strength in longer direction
b) Greater tensile strength in shorter direction
c) Same tensile strength in all directions
d) None of these
 4. Soil cement block help in reducing the amount of:
a) Sand b) Cement c) Water d) Mortar
 5. Concrete hollow bricks have the following characteristics:
a) Less thermal insulation b) Costly
c) Fast construction d) Decrease floor area
 6. _____ are widely used in rural areas for construction of walls?
a) Red bricks b) Stabilized mud blocks
c) Lime based bricks d) Hollow bricks
 7. Recycling steel reduces:
a) Energy use by 75% b) Energy use by 50%
c) Energy use by 35% d) Energy use by 20%

8. Which of the below roofing materials is most cost effective?
 a) Asphalt b) Plastic c) Rubber d) Metal
9. Low cost housing in Kerala was first developed by:
 a) Lawrence Becker b) Larry baker
 c) Laurence Becker d) Laurie baker
10. For natural and cost effective ventilation _____ can be used
 a) Hollow bricks b) Wall openings
 c) Skylight d) Brick jali
11. In Rat Trap Bond masonry, course height is
 a) 110mm b) 75mm c) 230mm d) 190mm
12. For ordinary soil which foundation can reduce cost?
 a) Isolated b) Arch c) Ream pile d) Combined
13. Which of the below is not a filler material in filler slabs?
 a) Rubber pieces b) Clay pots
 c) Burnt clay bricks d) Coconut shell
14. Rat trap bond masonry requires _____ less mortar
 a) 10% b) 50% c) 40% d) 20%
15. The disposal of sewage from the septic tank is done by which of the following:
 a) Clarifier b) Soak pit c) Aerated lagoon d) Sludge tanks
16. Which is the biggest source of CO₂ emission at the global level?
 a) Electricity b) Transportation c) Agriculture d) Manufacturing
17. The total set of carbon emissions caused by an individual / company / business is called?
 a) Carbon handprint b) Carbon footprint
 c) Carbon index d) Carbon sink
18. Which are the characteristics of materials used for construction of pre fabricated structures?
 a) Thermal insulation property b) Combustibility
 c) Havier materials d) None of these
19. Cement stabilization cannot be used in which of the below soil types?
 a) Granular b) Silty c) Lean clay d) Organic
20. Which of the following statements about concrete frame is false?
 a) They are replacing timber frames in urban areas.
 b) They cost less than timber frames.
 c) They cost more than timber frames.
 d) They are cheaper than iron frames.
21. Which of the following statements is true about global warming?
 a) Global warming has led to large scale deforestation.
 b) Global warming has led to a rise in the sea levels.
 c) Global warming has led to a rapid increase in the population across several countries.
 d) Global warming has led to a huge amount of waste generation.

33. LEED means _____
- Leadership in Energy and Environmental Document.
 - Leadership in Energy and Environmental Design.
 - Leadership in Energy and Efficiency Document.
 - Leadership in Energy and Efficiency Design.
34. GRIHA means that _____
- Green Rating for Integrated Habital Assessment.
 - Green Rating for Information Habital Assessment.
 - Green Rating for Indian Habital Assessment.
 - Green Rating for International Habital Assessment.
35. Carbon foot print can be measured by
- Carbon dating
 - Instruments
 - Carbon accounting
 - Formula
36. For a gold leed certification, how many points are required?
- 40-49
 - 60-79
 - 50-59
 - 80-110
37. Which of the below is a global scale environmental issue?
- Eutrophication
 - Regional ozone
 - Climate change
 - Pollution
38. Which of the following is/are not an objectives of sustainable development?
- Continue to implement the family planning program.
 - Maintain a dynamic balance of arable land (not less than 123 million hectares) and implement an agricultural development strategy.
 - Maintain a dynamic balance of water resources by reducing water consumption for every unit of gross development product growth and agricultural value added.
 - To bring about a gradual and sometimes catartrophic transformation of the environment.
39. Where is India's first Green Building located?
- ITC Green Center, Gurgaon
 - CII-Sohrabji Green Business Center Hyderabad.
 - WIPRO-Technologies – Gurgaon
 - Suzlon one Earth – Pune.
40. Which of the following is a disadvantage of green building?
- Increases 15-20% cost as compared to normal building.
 - Modern techniques are required.
 - Expert technicians are required
 - All of these
41. LCA means that _____
- Life Cycle Assessment
 - Life Council Assessment
 - Life Cycle Association
 - Local Cycle Assessment
42. Which of the following best green economy?
- A high carbon, resource inefficient and socially inclusive economy.
 - A low carbon, resource efficient and socially inclusive economy.
 - A low carbon, resource inefficient and socially exclusive economy.
 - A high carbon, resource efficient and socially inclusive economy.

43. What is the goal of sustainability in any process?
- a) To maintain the process finitely
 - b) To eventually eliminate the process
 - c) To maintain the process indefinitely
 - d) To support damaging the environment.
44. What is solar heating and cooling?
- a) Use solar energy to regulate the internal temperature of a given space.
 - b) Use solar energy to regulate the temperature of environment.
 - c) Use solar energy to monotonically increase the internal temperature of a given space.
 - d) Use solar energy to monotonically decrease the temperature of a given space.
45. Which of the following is used to regulate temperature in solar heating and cooling system?
- a) Air conditioners
 - b) Specific building systems
 - c) Water heaters
 - d) Room heaters
46. Which of the following is not used in a passive / solar heating / cooling system?
- a) Building walls
 - b) Building roofs
 - c) Air conditioners
 - d) Building floors.
47. What is a passive solar heating and cooling system?
- a) Uses building design with mechanical systems to regulate the temperature outside a given space.
 - b) Uses building design with mechanical systems to monotonically increase the temperature inside a given space.
 - c) Uses building design without any solar heating (and cooling) system to regulate the temperature outside a given space.
 - d) Uses building design without any solar heating (and cooling) system to regulate the temperature inside a given space.
48. Which of the following is a design element for residential buildings in temperate and tropical climates?
- a) Latitude
 - b) Diurnal variations in temperature
 - c) Using thermal mass to store excess solar energy during winter
 - d) Obstacles.
49. What is the main benefit of renewable energy?
- a) It reduces carbon emissions
 - b) It creates more jobs
 - c) It is cheaper than fossil fuels
 - d) It is easier to transport.
50. What can individuals do to promote sustainable development?
- a) Make suitable choices in their daily lives
 - b) Reduces their carbon foot print
 - c) Support sustainable initiatives in their communities
 - d) All of these

CBCS SCHEME

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21MAT41

Fourth Semester B.E. Degree Examination, Dec.2023/Jan.2024 Complex Analysis, Probability and Statistical Methods

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- 1 a. State and prove Cauchy's Riemann in polar form. (06 Marks)
- b. Determine the analytic function $f(z) = u + iv$ given that the real part $u = e^{2x}(x \cos 2y - y \sin 2y)$. (07 Marks)
- c. Evaluate : $\int_{(0,3)}^{(2,4)} (2y + x^2)dx + (3x - y)dy$ along the parabola $x = 2t, y = t^2 + 3$. (07 Marks)

OR

- 2 a. State and prove Cauchy's integral theorem. (06 Marks)
- b. Evaluate $\int_C \frac{e^{2z}}{(z+1)(z-2)} dz$ where $C : |z| = 3$. (07 Marks)
- c. If $f(z)$ is analytic show that $\left[\frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial y^2} \right] |f(z)|^2 = 4 |f'(z)|^2$. (07 Marks)

Module-2

- 3 a. Obtain the series solution of Bessel's differential equation : $x^2 \frac{d^2 y}{dx^2} + x \frac{dy}{dx} + (x^2 - n^2)y = 0$. (06 Marks)
- b. If α and β are roots $J_n(x) = 8$ then prove that $\int_0^1 x J_n(\alpha x) J_n(\beta x) dx = 0$. (07 Marks)
- c. If $x^3 + 2x^2 - x + 1 = a P_0(x) + b P_1(x) + c P_2(x) + d P_3(x)$ find the values of a, b, c, d. (07 Marks)

OR

- 4 a. Prove that $P_n(x) = \frac{1}{2^n \cdot n!} \frac{d^n}{dx^n} [(x^2 - 1)^n]$. (06 Marks)
- b. Prove that $P_3(\cos \theta) = \frac{1}{8} (3 \cos \theta + 5 \cos 3\theta)$. (07 Marks)
- c. Prove that $J_{-\frac{1}{2}}(x) = \sqrt{\frac{2}{\pi x}} \cos x$. (07 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

Module-3

- 5 a. Find the coefficient of correlation and obtain the lines of regression for the following data :

x	1	2	3	4	5	6	7	8	9
y	9	8	10	12	11	13	14	16	15

(06 Marks)

- b. The equations of regression lines of two variables x and y are $x = 19.13 - 0.87y$ and $y = 11.64 - 0.50x$, find the correlation coefficient and means of x and y .

(07 Marks)

- c. Fit a curve of the form $y = a + bx$ for the following data hence find y at $x = 15$.

x	1	3	4	6	8	9	11	14
y	1	2	4	4	5	7	8	9

(07 Marks)

OR

- 6 a. If the variable x and y such that :

i) $x + y$ has variance 15

ii) $x - y$ has variance 11

iii) $2x + y$ has variance 29 find σ_x , σ_y and coefficient of correlation.

(06 Marks)

- b. Fit a parabola $y = a + bx + cx^2$ to the following data :

x	1	2	3	4	5	6	7
y	2.3	5.2	9.7	16.5	9.4	35.5	54.4

(07 Marks)

- c. Fit a curve of the form $y = ax^b$ for the following data :

x	1	2	3	4	5
y	0.5	2	4.5	8	12.5

(07 Marks)

Module-4

- 7 a. The p.d.f of a variate x is given by the following data :

x	-2	-1	0	1	2	3
P(x)	0.1	K	0.2	2K	0.3	K

Find the value of K . Also find $P(x \geq 0)$ and $P(-2 < x < 2)$.

(06 Marks)

- b. Derive the mean and variance of the Binomial distribution.

(07 Marks)

- c. If the mean and standard deviation of the number of correctly answered questions in a test given to 4096 students are 2.5 and $\sqrt{1.875}$. Find an estimate of the number of conditions answering correctly i) 8 or more questions ii) 2 or less.

(07 Marks)

OR

- 8 a. The number of accidents in a year to taxi drivers in city follows a Poisson distribution with mean 3. Out of 1000 taxi drivers find approximately the number of the drivers with :

i) No accident in a year

ii) More than e accident in a year.

(06 Marks)

- b. Find the value of C such that $f(x) = \begin{cases} \frac{x}{6} + c & 0 \leq x \leq 3 \\ 0 & \text{elsewhere} \end{cases}$ is p.d.f. Also find $P(1 \leq x \leq 2)$.

(07 Marks)

- c. In a normal distribution 31% of the items are under 45 and 8% of the items are over 64. Find the mean and standard deviation of the distribution.

(07 Marks)

Module-5

- 9 a. x and y are independent random variable, x takes values 2, 5, 7 with the probability $\frac{1}{2}, \frac{1}{4}, \frac{1}{4}$ respectively. y takes the values 3, 4, 5 with probability $\frac{1}{3}, \frac{1}{3}, \frac{1}{3}$.
- Find the joint probability of X and Y
 - Show that the covariance of X and Y is equal to zero.
- b. Define :
- Null hypothesis
 - Type – I and Type – II errors
 - Degree of freedom
 - Level of Significance.
- c. 4 coins are tossed 100 times and the following results were obtained. Fit a binomial distribution for the data and test the goodness and fit. ($\chi_{0.05}^2 = 9.49$ for 4 pd.f.).

(06 Marks)

(07 Marks)

(07 Marks)

OR

- 10 a. In a hospital 230 females and 270 males were born in a year. Do these figures confirm the hypothesis that sexes are born in equal proportions. (10 Marks)
- b. Random sample of 1000 engineering students from a city A and 800 from city B were taken. It was found that 400 students in each of the sample were from payment quota. Does the data reveal a significant different between the two cities in respect to payment quota students? (10 Marks)

OR

- 4 a. What are the important points to be considered for selection of construction equipment? (10 Marks)
- b. Determine the probable cost per hour for owning and operating a power shovel (crawler tractor mounted) for the following conditions :
- Engine, 160hp, diesel
- Crank capacity = 30 litres
- Time between oil charges = 100 hrs
- Operating factor = 0.6
- Useful life = 5 years
- Investment = 12% of pav
- Hours used per year = 2000
- Total initial cost = Rs. 5,47,060
- Estimated salvage value = Rs. 40,000
- Diesel = 80 rupees/litre,
- Lubricating oil = 100 rupees/liter. (08 Marks)
- c. Give any four advantages of material management. (02 Marks)

Module-3

- 5 a. What is ISO9000? Explain the benefits of having ISO9000 certification. (08 Marks)
- b. Describe the safety measures to be adopted during hot bituminous work to avoid accidents. (06 Marks)
- c. Define values, morals and ethics. List out six ethical principles applicable to construction industry. (06 Marks)

OR

- 6 a. What is whistle blowing? Explain in detail types of whistle blowing. (08 Marks)
- b. Describe safety insurance. Briefly explain Contractor's All Risk (CAR) policy. (06 Marks)
- c. Explain in detail costs of quality in construction. (06 Marks)

Module-4

- 7 a. What is engineering economics? Explain the principle of engineering economics. (08 Marks)
- b. The two machines A and B have the following costs with the money worth as 8% per year.

Particulars	A	B
First cost	Rs. 10,000	Rs. 25,000
Salvage value	Rs. 1,100	Rs. 1,500
Uniform end of year expenditure	Rs. 3,000	Rs. 2,000
Irregular expenses at end of 1 st year	Rs. 1,000	—
Irregular expenses at end of 3 rd year	—	Rs. 2,500
Benefits from quality control (at end of year)	—	Rs. 600
Life	2 years	5 years

Compare the machines for the following bases :

- i) Present Worth
- ii) Equivalent Annual Cost Worth

OR

- 8 a. Briefly describe problem solving and decision making. (08 Marks)
- b. Maintenance costs for a new bridge with an expected 50 year life was estimated to be Rs. 10,000 each year for the first five years followed by Rs. 1,00,000 expenditure in the 15th year and Rs. 1,00,000 expenditure in 30th year. If $i = 10\%$ year, what is the equivalent uniform annual cost over the entire 50 year period? (06 Marks)
- c. Define the following terms related to engineering economics :
- Salvage value
 - Capitalized cost
 - Time value of money.

(06 Marks)

Module-5

- 9 a. Explain the functions of entrepreneur. (08 Marks)
- b. Define micro, small and medium enterprises. List and explain characteristics of MSME. (08 Marks)
- c. Describe the features of venture capital. (04 Marks)

OR

- 10 a. What is a business plan? Explain the different objectives of business plan. (08 Marks)
- b. Explain the scope and role of following agencies :
- TECKSOK
 - KSFC.
- c. List the different state level and central government institutions to assist finance for entrepreneur. (04 Marks)



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18CV52

Fifth Semester B.E. Degree Examination, Dec.2023/Jan.2024 Analysis of Indeterminate Structures

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1. Analysis the continuous beam shown in Fig.Q1 by slop deflection method. Draw SFD, BMD and electric curve.

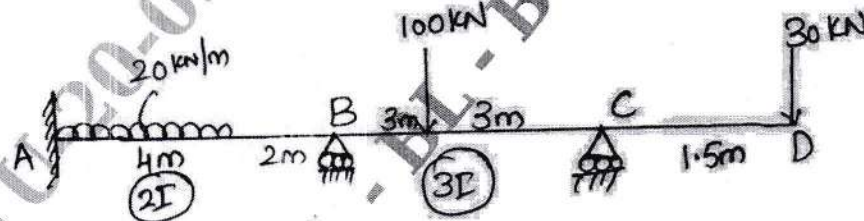


Fig.Q1

(20 Marks)

OR

2. Analysis the portal frame shown in Fig.Q2 by slope deflection method. Draw BMD and electric curve.

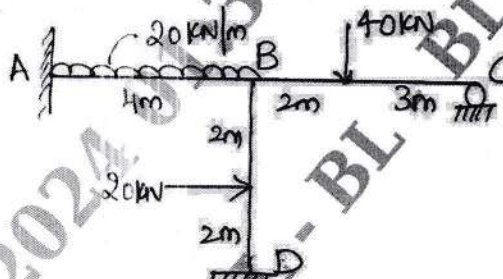
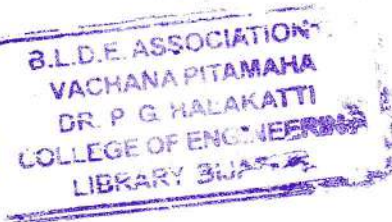


Fig.Q2

(20 Marks)



Module-2

3. Analyse the continuous beam shown in Fig.Q3 by moment distribution method and draw SFD and BMD. Support 'B' and 'C' settles by 8mm and 3mm respectively. Take $EI = 2 \times 10^4 \text{ kN/m}^2$.

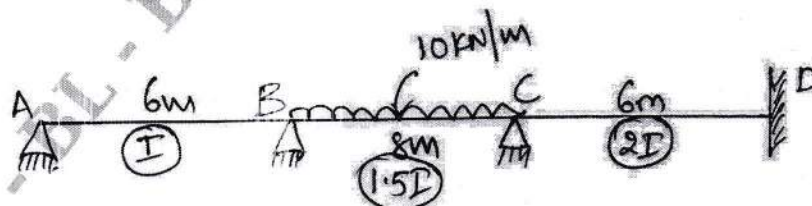


Fig.Q3

(20 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

OR

- 4 Analyse the frame shown in Fig.Q4 by moment distribution method and draw BM diagram and elastic curve.

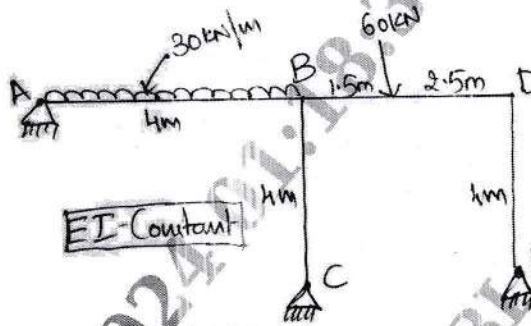


Fig.Q4

(20 Marks)

Module-3

- 5 Analyse the three span continuous beam shown in Fig.Q5 by Kani's method. Draw BMD, SFD and Elastic curve.

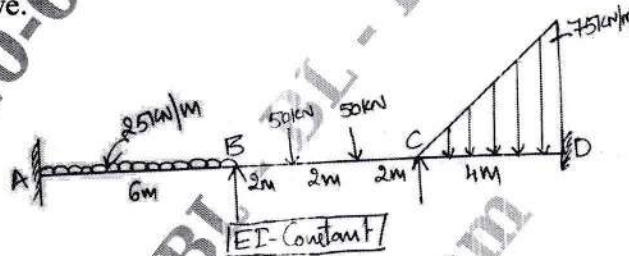


Fig.Q5

(20 Marks)

OR

- 6 Analyse the frame shown in Fig.Q6 by Kani's method. Draw BMD.

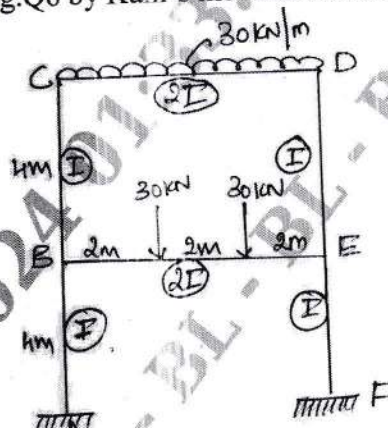


Fig.Q6

(20 Marks)

Module-4

- 7 Analyse the beam show in Fig.Q7 by flexibility matrix method. Draw SFD and BMD. Take EI constant.

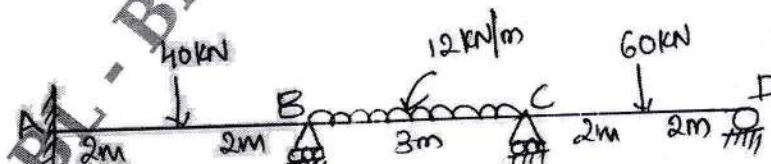


Fig.Q7

(20 Marks)

OR

- 8 Analyse the frame shown in Fig.Q8 by flexibility matrix method. Draw SFD and BMD.

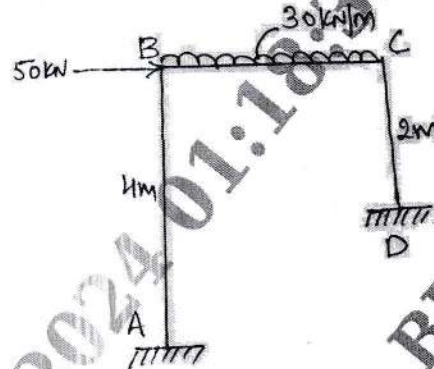


Fig.Q8

(20 Marks)

Module-5

- 9 Analyse the beam shown in Fig.Q9 by stiffness matrix method. Draw SFD and BMD.

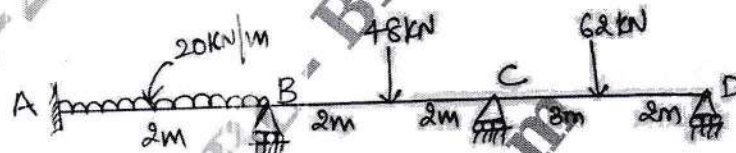


Fig.Q9

(20 Marks)

OR

- 10 Using stiffness method determine the displacements at the joint 'B' of a Pin-jointed frame shown in Fig.Q10. Also calculate the forces in the members AB and BC due to given loading. The value of area of cross-section are indicated. Take $E = 2 \times 10^5 \text{ N/mm}^2$.

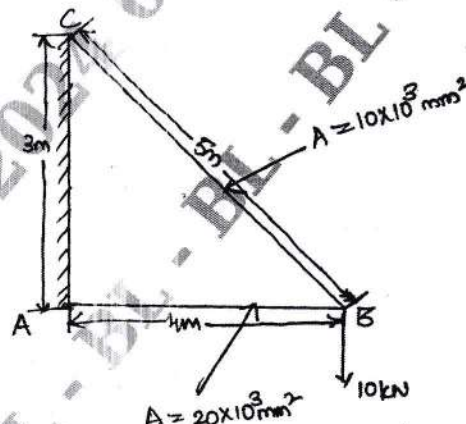
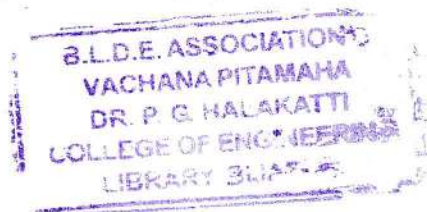


Fig.Q10

(20 Marks)



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Fifth Semester B.E. Degree Examination, Dec.2023/Jan.2024 Design of RCC Structural Elements

Time: 3 hrs.

Max. Marks: 100

**Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. Use of IS – 456 – 2000 code, SP – 16 code book allowed.**

Module-1

- 1 a. Differentiate working stress method and limit state method. (04 Marks)
- b. Explain stress block parameters with neat sketches. (08 Marks)
- c. Differentiate balanced, under reinforced and over reinforced sections. (08 Marks)

OR

- 2 a. What are the causes of cracks in reinforced concrete members? Explain. (06 Marks)
- b. A simply supported beam of rectangular section $250 \times 450\text{mm}$ is used over an effective span of 4m. The beam is reinforced with 3 bars of 20mm diameter Fe-415 HYSD bars at an effective depth of 400mm. Two hanger bars of 10mm diameter are provided. The self wt of the beam together with the dead load on the beam is 4kN/m. Service load = 10kN/m, using M-20 grade concrete compute :
 - i) The short term deflection
 - ii) The long term deflection according to the Indian standard code IS : 456 – 2000.(14 Marks)

Module-2

- 3 a. Calculate the ultimate flexural strength of a tee beam section having the following section properties.
 Width of flange = 1200mm,
 Depth of flange = 120mm
 Width of rib = 300mm
 Effective depth = 600mm
 Area of steel = 8 bars of 25mm diameter
 Materials : M₂₀ grade concrete, F_c – 415 HYSD bars (06 Marks)
- b. A doubly reinforced concrete beam having a rectangular section 250mm wide and 540mm overall depth is reinforced with 2 bars of 12mm diameter in compression side and 4 bars of 20mm diameter in tension side. The effective cover to bars is 40mm. Using M-20 grade concrete and Fe – 415 HYSD bars. Estimate the flexural strength of the tension using IS – 456 – 2000 code recommendations. (08 Marks)
- c. A reinforced concrete beam of rectangular section with a width of 300mm and effective depth 600mm is reinforced with 4 bars of 25mm diameter as tension reinforcement. Two of the tensions bars are bent up at 45° near support section. The beam is also provided with double legged vertical links of 8mm diameter at 150mm centers near supports. Using M-25 grade concrete and Fe – 415 HYSD bars. Compute the ultimate shear strength of the support section. (06 Marks)

OR

- 4 a. What do you mean by doubly reinforced beam? Explain the necessity of providing doubly reinforced beam. (06 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

- b. A tee beam has the following cross sectional details :
Effective width of flange = 2000mm, Thickness of flange = 150mm, width of rib = 300mm,
Effective depth = 1000mm, calculate the limiting or balanced moment capacity of the
section and area of tension reinforcement M20 and Fe415. (10 Marks)
- c. Explain shear failure of RC members. (04 Marks)

Module-3

- 5 Design a reinforced concrete beam of the rectangular section using the following data,
effective span = 5m, width of beam = 250mm, overall depth = 500mm, service load
(DL + LL) = 40kN/m, Effective cover = 50mm
Materials: M-20 Grade concrete, Fe -415 HYSD bars. (20 Marks)

OR

- 6 Design a L beam for an office floor to suit the following data,
Clear span = 8m, Thickness of flange = 150mm, Live load = 4kN/m², Spacing bars = 3m,
 $f_{ck} = 20\text{N/mm}^2$, $f_y = 415\text{N/mm}^2$ L beams are monolithic with RC columns, width of column
= 300m. (20 Marks)

Module-4

- 7 Design a two way slab for an office floor of size 3.5m × 4.5m with discontinuous and simply
supported edges on all the sides with corners prevented from lifting and supporting a service
live load of 4kN/m². Adopt M-20 grade concrete and Fe415 HYSD bars. (20 Marks)

OR

- 8 Design one of the flights of a dog-legged stairs spanning between landing beams using the
following data, Number of steps = 10, Tread = 300mm, Rise = 150mm width of landing
beams = 300mm, Use M₂₀ grade concrete, and Fe – 415 HYSD bars ($f_y = 415\text{N/mm}^2$).
(20 Marks)

Module-5

- 9 a. Design the reinforcement in a circular column of diameter 300mm to support a service axial
load of 800kN. The column has an unsupported length of 3m and braced against side way.
Column is reinforce with helical ties adopt M₂₀ Grade concrete Fe-415 HYSD bars.
(10 Marks)
- b. Design the reinforcements in a short column 400 × 400 mm at the corner of a multistoried
building to support an axial factored load of 1500kN, together with biaxial moments of
50kN-m acting in perpendicular planes. Adopt M-20 grade concrete and Fe-415 HYSD bars.
(10 Marks)

OR

- 10 Design a reinforced concrete footing for a rectangular column of section 300 × 500mm
supporting an axial factored load of 1500kN. The safe bearing capacity of the soil at site is
185kN/m². Adopt M₂₀ Grade concrete and Fe -415 HYSD bars. (20 Marks)

CBCS SCHEME

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18CV54

Fifth Semester B.E. Degree Examination, Dec.2023/Jan.2024 Basic Geotechnical Engineering

Time: 3 hrs.

Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
 2. Missing data, if any, may be suitably assumed.

Module-1

- 1 a. With the help of three phase diagram, define the terms : degree of saturation, water content, voids ratio and specific gravity of soil. Establish the phase relation among them. (10 Marks)
- b. State Stoke's law. Enlist the limitations of the same as applied to soil particle analysis. (06 Marks)
- c. A soil sample having bulk unit weight of 16kN/m^3 has a water content of 25%. The specific gravity of soil particles is 2.7. Determine :
 - i) Dry unit weight
 - ii) Voids ratio
 - iii) Porosity
 - iv) Degree of saturation. (04 Marks)

OR

- 2 a. With a neat sketch, explain plasticity chart and its use in classification of fine grained soils. (06 Marks)
- b. Following are the results of liquid limit test on a clay sample having plastic limit of 20%. Plot the flow-curve and obtain :
 - i) Liquid limit
 - ii) Flow index
 - iii) Consistency index,
 If natural water content of soil is 18%.

Number of blows	12	18	22	34
Water content (%)	56	52	50	45

- c. With a neat sketch, explain the particle size distribution characteristic of : well graded, poorly graded and gap graded soils. (06 Marks)

Module-2

- 3 a. List the clay minerals and explain any two with their structures. (08 Marks)
- b. Briefly explain the following :
 - i) Dispersed and flocculated structure
 - ii) Diffused double layer theory
 - iii) Base - exchange phenomenon. (12 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
 2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

OR

- 4 a. Distinguish between standard and modified proctor compaction test. (06 Marks)
 b. Briefly discuss the factors affecting compaction. (06 Marks)
 c. The following data refers to standard proctor compaction test on a soil. Plot the compaction curve and determine MDD and corresponding DMC. Mark zero air voids line. Assume $G = 2.7$.

Water content (%)	9.5	11	12	14	16	18	19.5
Bulk unit weight (kN/m^3)	18	19	19.6	20.5	21	20.5	20

(08 Marks)

Module-3

- 5 a. State Darcy's law and its limitations as applied to flow through soils. (06 Marks)
 b. Derive an expression for coefficient of permeability by variable head test. (06 Marks)
 c. A clay sample is 80mm in diameter and 100mm in height. The permeability of the sample is estimated to be 10×10^{-3} mm/sec. If, in the test, the head in a standing pipe falls from 240mm to 120mm in 3 minutes, determine the diameter of standing pipe used in the test. (08 Marks)

OR

- 6 a. Derive an expression for effective stress for a saturated soil and hence define total stress, effective stress and neutral pressure. (06 Marks)
 b. What are flow nets? List its characteristics and uses. (06 Marks)
 c. Sub soil at a site consists of 3m thick dry sand ($G = 2.67$, $e = 0.85$) which is underlain by a 3.5m thick clay stratum ($G = 2.72$, $w = 28\%$) followed by rock. The ground water table is located at a depth of 1.5m below ground surface. The sand layer is saturated by capillary rise of 0.42m above water-table. Plot the distribution of total, neutral and effective stress. (08 Marks)

Module-4

- 7 a. List the assumptions of Mohr-coulomb shear strength theory. Express shear strength equation for soils with all its notations. (06 Marks)
 b. Enlist drainage conditions that can be simulated in triaxial test and how these simulates field problems. (06 Marks)
 c. The direct shear test conducted on a soil specimen gave the following results at failure. Draw Mohr's envelope and determine shear parameters. For the test result on first specimen, determine orientation of principal planes and magnitude of principal stresses.

Test number	1	2	3
Normal stress (kN/m^2)	100	150	200
Shear stress (kN/m^2)	50	70	90

(08 Marks)

OR

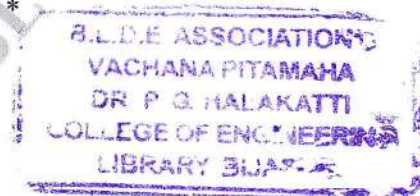
- 8 a. Derive the relationship between principle stress at failure and shear parameter C and ϕ . (06 Marks)
- b. Briefly enlist the merits and demerits of 'Direct shear test'. (06 Marks)
- c. A particular soil failed under a major principal stress of 288kN/m^2 with corresponding minor principal stress of 100kN/m^2 . If for the same soil, the minor principal stress had been 200kN/m^2 , determine graphically, what is the major principal stress at failure would have been if:
- i) $\phi = 0$ and ii) $C = 0$ iii) $C = 12\text{kN/m}^2$. (08 Marks)

Module-5

- 9 a. Briefly explain spring analogy to explain principle of consolidation. (06 Marks)
- b. List the assumptions of Terzaghi's one dimensional consolidation theory. (06 Marks)
- c. During an Oedometer test, the voids ratio of eh sample decreased from 0.85 to 0.73 as the pressure increased from 1 to 2 kg/cm^2 . If the coefficient of permeability of the soil is $3.3 \times 10^{-4} \text{ cm/s}$, determine coefficient of volume change and coefficient of consolidation of soil. (08 Marks)

OR

- 10 a. Explain with neat sketch, Casagrande's method of determining pre consolidation pressure. (06 Marks)
- b. Discuss the principle and procedure of determining coefficient of consolidation by square root time fitting method. (06 Marks)
- c. In a laboratory test on the consolidation of clay sample of 20mm thick under double drainage, the time required for 50% consolidation was 30 minutes. Calculate coefficient of consolidation. Also, calculate the time required for 90% consolidation of the same clay in the field having 2m thick clay stratum and with drains on efface only. Take $T_{V_{50}} = 0.196$ and $T_{V_{90}} = 0.848$. (08 Marks)



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18CV55

Fifth Semester B.E. Degree Examination, Dec.2023/Jan.2024 Municipal Waste Water Engineering

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- 1 a. Explain the need for sanitation and factors affecting dry weather flow. (08 Marks)
- b. The drainage area of one section of a town is 20 hectares. The classification of the surface of this area is as follows:

% of total surface area	Type of surface	Runoff Coefficient
25%	Hard Pavement	0.85
25%	Roof Surface	0.80
15%	Unpaved Streets	0.30
25%	Gardens and lawns	0.15
10%	Wooded Area	0.10

If the time of concentration for the area is 30 minutes, find the maximum runoff. Use the following formula for intensity of rainfall

$$R_i = \frac{900}{t + 60} \quad (12 \text{ Marks})$$

OR

- 2 a. Explain (i) Lamp Manhole (ii) Catch Basin (08 Marks)
- b. A certain city has a population of 50,000 residing an area of 40 hectares. Find the design discharge for the sewer line, with the following data:
 - (i) Demand = 200 LPCD
 - (ii) Avg permeability coefficient for entire area = 0.3
 - (iii) Time of concentration = 50 minutes
 The sewer line is to be designed for a flow equivalent to the wet weather flow (W.W.F) plus twice the Dry Weather Flow (D.W.F). Use U.S. Ministry of Health formula. Assume that 75% of water supply reaches in sewer as wastewater. (12 Marks)

Module-2

- 3 a. Explain self cleaning and non-scouring velocity. (08 Marks)
- b. A stone-ware sewer, 30 cm in diameter is laid at a gradient of 1 in 100. Using $N = 0.013$ in Manning's formula, calculate the velocity discharge and Chey's coefficient when the sewer is running full. (12 Marks)

OR

- 4 a. With a neat sketch, explain crown corrosion of sewer. (08 Marks)
- b. Find the minimum velocity and gradient required to transport coarse sand through a sewer of 60 cm diameter with sand particles of 1 mm diameter and specific gravity 2.66. Assume β (characteristics of solids) = 0.06 and $f = 0.02$ (Darcy friction factor). Assume the sewer to run half full. Take $N = 0.012$. (12 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
 2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

Module-3

- 5 a. Explain screening unit of treatment process with neat sketch. (08 Marks)
 b. A stream saturated with DO, has a flow of $1.2 \text{ m}^3/\text{s}$, BOD of 4 mg/L and rate constant of 0.3 per day. It receives an effluent discharge of $0.25 \text{ m}^3/\text{s}$ having BOD 20 mg/L , DO 5 mg/L and rate constant 0.13 per day. The average velocity of flow of the stream is 0.18 m/s . Calculate the DO deficit at point 20 km and 40 km downstream. Assume that the temp is 20°C throughout and BOD is measured at 5 days. Take saturation DO at 20°C as 9.17 mg/L . (12 Marks)

OR

- 6 a. With a neat sketch explain Oxygen Sag Curve. (08 Marks)
 b. A town discharges 80 cumecs of sewage into 9 stream having a rate of flow of $1200 \text{ m}^3/\text{s}$ during lean days, at a 5 day BOD of sewage at a given temp is 250 mg/L . Find the amount of critical DO deficit and its location in the downstream portion of the stream. Assume deoxygenation co-efficient K as 0.1 and co-efficient of self purification (f_s) as 3.5 . Assume saturation DO at given temperature as 9.2 mg/L . (12 Marks)

Module-4

- 7 a. With a neat sketch explain activated sludge process. (10 Marks)
 b. Define the following terms :
 a) HRT b) Volumetric BOD loading
 c) F/m ratio d) SRT (Solids retention time) (10 Marks)

OR

- 8 a. With a neat sketch explain working principle of Trickling filter. (10 Marks)
 b. With a neat sketch explain working principle of waste stabilization pond. (10 Marks)

Module-5

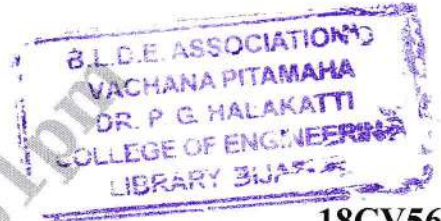
- 9 a. Explain Nitrification and Denitrification process. (10 Marks)
 b. Explain (i) Advanced Oxidation Process (ii) Electro-coagulation. (10 Marks)

OR

- 10 a. Explain (i) Soak pit (ii) Septic tank (10 Marks)
 b. Explain (i) Eco-toilet (ii) Two pit latrines. (10 Marks)

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18CV56

Fifth Semester B.E. Degree Examination, Dec.2023/Jan.2024 Highway Engineering

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- 1 a. What are the recommendations of Jayakar committee and how are they implemented? (08 Marks)
- b. List out different modes of transportation and compare among them. (08 Marks)
- c. Discuss the Socio – Economic impact of improving transport infrastructures? (04 Marks)

OR

- 2 a. Discuss the different types of roads and classification of roads in detail. (08 Marks)
- b. Explain all types of road patterns in detail with neat sketches. (12 Marks)

Module-2

- 3 a. Explain two lane width of pavement with neat sketch, mention the IRC recommendations for the same for various classes of roads. (08 Marks)
- b. Calculate the minimum sight distance required to avoid head on collision of two cars approaching from opposite direction at 90 and 60kmph. Assume a reaction time of 2.5secs, co-efficient of friction of 0.7 and a break efficiency of 50 percent in both cases. (08 Marks)
- c. Define stopping sight distance and overtaking sight distance. (04 Marks)

OR

- 4 a. The radius of horizontal curve (circular) is 100m, the design speed is 50kmph and the design co-efficient of lateral friction is 0.15 :
 - i) Calculate the super elevation required
 - ii) Calculate the co-efficient of friction if no super elevation is provided. (08 Marks)
- b. Write note on :
 - i) Widening of pavement
 - ii) Radius of horizontal curve
 - iii) Method of introducing extra widening in field
 - iv) Objects of providing transition curves. (12 Marks)

Module-3

- 5 a. List out the desirable properties of soil used as a highway material. (04 Marks)
- b. Explain California Bearing Ratio (CBR) Test with all necessary sketches and formulas. (12 Marks)
- c. What are the various soil classifications systems used in field of highway engineering? (04 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

OR

- 6 a. Differentiate between Bitumen and Tar. (04 Marks)
 b. Explain different components and functions of flexible pavement and Rigid pavements. (08 Marks)
 c. Explain the concept of ESWL with the help of neat sketch. (08 Marks)

Module-4

- 7 a. Explain step-by-step procedure for construction of WMM base course with specifications. (10 Marks)
 b. Explain step-by-step procedure for construction of Bituminous Macadam Base Course. (10 Marks)

OR

- 8 a. Write a note on :
 i) Quality control checks of GSB
 ii) Dense Bituminous macadam
 iii) Quality control during construction of C.C. Pavements
 iv) Different types of C.C. Pavement. (12 Marks)
 b. Explain step-by-step procedure for construction of Dry Lean Concrete (DLC) of a rigid pavement by mentioning quality control requirements. (08 Marks)

Module-5

- 9 a. List out the requirements and importance of highway drainage. (08 Marks)
 b. Explain simplified steps for the design of longitudinal road drain. (12 Marks)

OR

- 10 a. Explain the various components of quantifiable and non-quantifiable benefits to the road users due to highway development projects. (08 Marks)
 b. Calculate the annual cost of stretch of highway from the following particulars :

Item	Total cost in lakhs	Estimated life years	Rate of interest
Land	35.0	100	6%
Earthwork	40.0	40	8%
Bridges and Culverts	—	—	—
Drainage	50.0	60	8%
Pavement	100.0	15	10%
Traffic signs and road appertence	15.0	05	10%

The average cost of maintenance of road is Rs.1.5 lakhs per year.

(12 Marks)

B/21.V sem-CV

B.L.D.E. ASSOCIATION'S
VACHANA PITAMAH
DR. P. G. HALAKATTI
COLLEGE OF ENGINEERING
BANGALORE

CBCS SCHEME

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21CV51

Fifth Semester B.E. Degree Examination, Dec.2023/Jan.2024 Hydrology and Water Resources Engineering

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- 1 a. Explain Hydrology – an Interdisciplinary Science. What are the practical application of hydrology? (10 Marks)
- b. The analysis of a storm yielded the following :

Isohyet Interval (mm)	70-80	80-90	90-100	100-110	110-120	120-130
Area (km) ²	10	85	113	98	136	67

- Calculate the average depth of rainfall. (05 Marks)
- c. Explain Double Mass curve technique to test consistency of data. (05 Marks)

OR

- 2 a. With a neat sketch, explain Horton's Qualitative representation of Hydrologic cycle. List the different forms of precipitation. (08 Marks)
- b. The average rainfall in cm at four existing rain gauge stations in a basin are 105, 79, 70 and 66. If the average depth of rainfall over basin is to be estimated with 10% error, determine the additional number of rain gauge required. (07 Marks)
- c. Explain with a neat sketch, Syphon type recording Rain gauge. (05 Marks)

Module-2

- 3 a. What are the factors affecting Evaporation rate? Explain briefly. (08 Marks)
- b. What are the components of unit hydrograph? Write a note on its applications. (06 Marks)
- c. Define Unit hydrograph and what are assumptions made the unit hydrograph. (06 Marks)

OR

- 4 a. What are the factors affecting the Runoff and explain details. (08 Marks)
- b. What are the limitations of Unit hydrograph theory? (06 Marks)
- c. Following are the ordinate of a 3 hours unit hydrograph derive the plot the 3 hours flood hydrograph due to an excess rainfall of 4.5 cms. (06 Marks)

Time (Hours)	0	3	6	9	12	15	18	21	24
3 - Hrs UHG m ³ /sec	0	1.5	4.5	8.6	12	9.4	4.6	2.3	0.8

Module-3

- 5 a. Define Irrigation. What is the necessity of Irrigation? (06 Marks)
- b. Explain the surface irrigation methods of water application to the crops. (08 Marks)
- c. Compare Flow irrigation and Lift irrigation. (06 Marks)

OR

- 6 a. Define Duty, Delta and Base period and establish a relationship between them. (08 Marks)
- b. What are factors affecting duty? What are the methods to improve the duty? (06 Marks)
- c. Explain the following terms : i) Application efficiency ii) Conveyance efficiency iii) Frequency of irrigation. (06 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

Module-4

- 7 a. With neat sketch, explain the types of canal alignment. (10 Marks)
 b. List the various factors to be considered in selecting a site for a reservoir. (10 Marks)

OR

- 8 a. Explain Mass curve method to determine the storage capacity of Reservoir. (12 Marks)
 b. What are the advantages of Lacey's theory compared to Kennedy's theory? (08 Marks)

Module-5

- 9 a. Which Indian rivers cause the most floods in India? (10 Marks)
 b. Explain the importance of water harvesting and conservation along with basic principles involved in process. (10 Marks)

OR

- 10 a. What are the steps taken to control drought? (10 Marks)
 b. Define the term "Rain Water Harvesting". Elaborate Rural technological system being adopted for water conservation. (10 Marks)

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21CV52

Fifth Semester B.E. Degree Examination, Dec.2023/Jan.2024 Transportation Engineering

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- a. Explain the importance of transportation. Write the advantages and disadvantages of different modes of transportation. (10 Marks)
b. Explain interpretation of planning survey. Briefly explain Vision 2021. (10 Marks)

OR

- a. Explain Engineering Surveys. (10 Marks)
b. Explain briefly various stages of work in new highway project. (10 Marks)

Module-2

- a. A state highway passing through a rolling terrain has a horizontal curve of radius equal to ruling minimum radius. Design all geometric features of horizontal curve, assuming suitable data. (12 Marks)
b. With a neat sketch briefly explain about camber and width of carriage way. (08 Marks)

OR

- a. Find safe overtaking sight distance for design speed 96 kmph, acceleration of overtaking vehicle 1.92 kmph/sec, draw neat sketch of overtaking zone (minimum). (10 Marks)
b. Write the difference between flexible pavement and rigid pavement. (10 Marks)

Module-3

- a. Explain the properties of aggregates and tests to be conducted on aggregates. (10 Marks)
b. CBR tests were conducted on two specimens of a soil. Determine CBR value of the soil, if 100 divisions of load dial represents 190kg load in the calibration chart of the proving ring.

Penetration of plunger, mm	Load dial reading, divisions	
	Specimen 1	Specimen 2
0.0	0	0
0.5	8	0.5
1.0	15	1.5
1.5	23	2.5
2.0	29	6.0
2.5	34	13
3.0	37	20
4.0	43	30
5.0	48	38
7.5	57	50
10.0	63	58
12.5	67	63
-	-	-

(10 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.



OR

- 6 a. Explain the design elements of highway embankment. (10 Marks)
b. Explain in brief the specification of material and construction steps of WMM layer. (10 Marks)

Module-4

- 7 a. With a neat sketch, explain the procedure for design of filter material in highway drainage. (10 Marks)
b. Explain in brief three methods of economic evaluation of highway projects. (10 Marks)

OR

- 8 a. Explain in briefly highway user benefits and Vehicle Operation Cost (VOC). (10 Marks)
b. Write note on BOT and BOOT. (10 Marks)

Module-5

- 9 a. Explain about traffic regulation and controls. (10 Marks)
b. Define the term "Runway Orientation". Explain about any one type of wind rose diagram. (10 Marks)

OR

- 10 a. Explain briefly functions of sleepers and ballast. (10 Marks)
b. Explain factors affecting selection of sites for an airport. (10 Marks)

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Fifth Semester B.E. Degree Examination, Dec.2023/Jan.2024 Design of RC Structural Elements

Time: 3 hrs.

Max. Marks: 100

- Note:** 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. Use of IS-456-2000, Sp-16 is permitted.
3. Assume suitable additional data, if necessary.

Module-1

- 1 a. Distinguish between working stress and limit state method of RCC design. (06 Marks)
b. Explain balanced, under-reinforced and over-reinforced section with sketches. (06 Marks)
c. From fundamental, derive expression for the area of stress block $0.36f_{ck}x_n$. (08 Marks)

OR

- 2 a. Explain the factors that affect short and long term deflection. (06 Marks)
b. A simply supported beam of rectangular section 200mm wide by 450mm overall depth is used over an effective span of 5m. The beam is reinforced with 3 bars of 16mm diameter of an effective depth of 420mm. the beam supports a live load of 10kN/m. Calculate short term deflection using M20 concrete and Fe 415 steel. (14 Marks)

Module-2

- 3 a. A singly reinforced beam of 250mm wide by 500mm effective depth is reinforced with 4 bars of 22mm diameter. Effective spa of beam is 6m. Assuming M20 grade concrete and Fe415 steel, determine the concentrated load at midspan that can be carried by the beam in addition to its self weight. (12 Marks)
b. A T-beam of depth 450mm has a flange width of 1000mm and depth of 120mm. It is reinforced with 6 bars of 20mm diameter on tension side with a cover of 30mm. If M20 concrete and Fe415 steel are used, calculated moment of resistance of the beam. Take web width = 300mm. (08 Marks)

OR

- 4 a. A doubly reinforced beam section is of 250mm wide and 500mm deep to the center of the tensile reinforcement. It is reinforced with 2 bars of 16mm diameter as compression steel at an effective cover of 40mm and 4 bars of 25mm diameter as tensile steel. Using M20 grade concrete and Fe415 steel, calculate the factored moment of resistance. (12 Marks)
b. Determine the area of tensile reinforcement required for T-beam having following details
Effective flange width = 2400mm
Depth of flange = 150mm
Width of web = 300mm
Effective depth = 750mm
Working moment 800kN-m
Type of concrete = M20 ; Type of steel = Fe415 MYSD bars (08 Marks)

Module-3

- 5 Design a cantilever beam of clear span 3.25m, service load is 15kN-m. Use M20 grade concrete and fe415 steel. Sketch the reinforcement details. (20 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

OR

- 6 a. List the circumstances under which doubly reinforced beams are recommended. (04 Marks)
 b. A RC beam is supported on two walls of 500mm thick, spaced at a clear distance of 6m. The beam carries a super imposed load of 30kN/m. Use M20 grade concrete and Fe415 steel. Design the beam for flexure and shear. Sketch the reinforcement detail. (16 Marks)

Module-4

- 7 The slab of a residential building of size 4.3m × 6m is simply supported on all four sides on 230mm walls. Assuming an imposed load of 2kN/m², and load due to finishes of 1.0kN/m², design the floor slab. Use M25 concrete and Fe 415 steel. Assume mild exposure. Sketch the reinforcement details. (20 Marks)

OR

- 8 Design one of the flights of a dog-legged staircase for an office building, given the following data :
 Height between floor = 3.2m, Riser = 160mm, Tread = 270mm, Width of flight = loading width = 1.25m, Live load = 5kN/m², finishes load = 0.6kN/m². Assume the stairs to be supported on 230mm thick masonry walls at the outer edges of the landing, parallel to the risers. Use M20 concrete and Fe 415 steel. Assume mild exposure conditions. Sketch the reinforcement details. (20 Marks)

Module-5

- 9 a. What is the note of transverse reinforcement in columns? What are the codal provisions to design the transverse reinforcement? (05 Marks)
 b. Design a short reinforced concrete column of rectangular section to carry an ultimate load of 600kN and ultimate moment of 100kN-m, acting about an axis bisecting the depth of the column. Assume the effective length of column is 4.5m. Width of the supported beam is 300mm. Use M20 concrete and Fe415 steel, provide equal steel on both tension and compression sides. Sketch reinforcement detail. (15 Marks)

OR

- 10 Design an isolated footing for a square column of size 400mm × 400mm, supporting a service load of 2200kN. Assume SBC of soil as 250 kN/m² at a depth of 1.5m below the ground. Use M20 concrete and Fe 415 steel for the footing. Sketch the reinforcement details. (20 Marks)

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21CV54

Fifth Semester B.E. Degree Examination, Dec.2023/Jan.2024 Geotechnical Engineering

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- 1 a. With the help of 3-phase diagram, explain:
 - (i) Void ratio (ii) Porosity (iii) Air content (iv) Degree of saturation (10 Marks)
- b. With usual notations, derive the relation $Y_d = \frac{(1 - n_a)GY_w}{WG + 1}$. (10 Marks)

OR

- 2 a. Explain the following:
 - (i) Liquid limit (ii) Shrinkage limit (iii) Plastic limit
 - (iv) Activity of clay (v) Relative density (10 Marks)
- b. Classify following soils as per IS classification:

Soil	% passing 4.75 mm	% passing 75 micron	C _u	C _c	W
A	98	02	6.7	1.2	I _p = 2.2
B	100	100	-	-	W _L = 400 W _p = 50

(10 Marks)

Module-2

- 3 a. Define permeability and explain factors affecting permeability. (10 Marks)
- b. The discharge of water collected from a constant head permeameter in a period of 15 minutes is 400 ml. The internal diameter of permeameter is 6cm and measured difference in heads between the two gauging points 15 cm apart is 40. Calculate the coefficient of permeability. If the dry weight of 15 cm long sample is 7N and specific gravity of the solids is 2.65. Calculate seepage velocity. (10 Marks)

OR

- 4 a. Explain effective stress and total stress concept. (08 Marks)
- b. Write a note on quick sand phenomena. (06 Marks)
- c. Explain impact of effective stress in construction of structures. (06 Marks)

Module-3

- 5 a. Discuss the factors affecting compaction of soils. (05 Marks)
- b. Write difference between standard and modified proctor's compaction. (03 Marks)
- c. The following are the results of compaction test:

Water content (%)	8	11.5	14.5	17.5	19.5	21.5
Mass of wet soil (gm)	1700	1900	2000	1980	1950	1920

If volume of mould used was 950 cc and specific gravity was 2.65:

- (i) Draw dry density versus water content curve, find OMC and MDD. (12 Marks)
- (ii) Plot 100% saturation line

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

OR

- 6 a. Write assumptions and Terzaghi's one dimensional consolidation theory. (06 Marks)
 b. With neat sketch, explain how pre-consolidation pressure is determined by Casagrande's method. (06 Marks)
 c. A soil sample of 20 mm thick take 20 minutes to reach 20% consolidation. Find the time taken for a clay layer 6m thick to reach 40% consolidation. Assume double drainage in both cases. (08 Marks)

Module-4

- 7 a. Explain Mohr's Coulomb's theory as applied to soil strength. (06 Marks)
 b. Write note on total and effective shear strength. (06 Marks)
 c. A specimen of clean dry, cohesionless sand is tested in shear box and soil is failed at shear stress of 40 kN/m^2 when the normal load on the specimen was 50 kN/m^2 . Determine:
 (i) Angle of shearing resistance
 (ii) The principal stresses during the failure (08 Marks)

OR

- 8 a. List the factors affecting shear strength of soils. (04 Marks)
 b. Explain Thixotrophy and sensitivity. (06 Marks)
 c. Two identical soil specimens were tested in triaxial apparatus. The first specimen failed at a deviator stress of 770 kN/m^2 . When the cell pressure was 200 kN/m^2 . Second specimen failed at deviator stress of 1370 kN/m^2 under pressure of 400 kN/m^2 . Determine the value of cohesion and angle of internal friction analytically. If soil is tested in a direct shear apparatus with normal stress of 600 kN/m^2 . Estimate shear stress at failure. (10 Marks)

Module-5

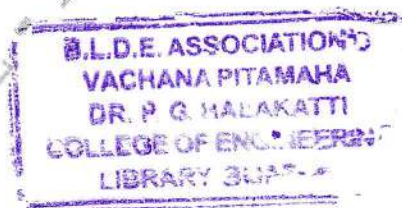
- 9 a. Explain modes of shear failure. (06 Marks)
 b. Discuss effect of water table on bearing capacity with neat sketch. (06 Marks)
 c. Compute the SBC of continuous footing at 1.8 m wide and locate at depth of 1.2 m below ground level in soil. Unit weight is 20 kN/m^3 and cohesion 20 kN/m^2 and internal friction 20° . Assume F.S. = 2.5. When is the permissible load per meter run of footing? Given $N_c = 17.7$, $N_g = 7.4$, $N_y = 5$ (08 Marks)

OR

- 10 a. What are the different types of settlements of footing? Explain. (06 Marks)
 b. Define differential and total settlement. (04 Marks)
 c. A soft normally consolidated clay layer is 18 m thick. The natural water content is 45%. The saturated unit weight is 18 kN/m^3 . The grain specific gravity is 2.7 and liquid limit is 63%. The vertical stress increment at the center of layer due to foundation load is 9 kN/m^2 . The ground water table is at the surface of the clay layer. Determine the settlement of foundation. (10 Marks)

- 8 In an Ecosystem, the energy flow is always
a) Always unidirectional
b) Always bidirectional
c) In any direction
d) Always down directional
- 9 Which of the following is considered as an alternate fuel
a) CNG b) Kerosene c) Coal d) Petrol
- 10 Nuclear power plant in Karnataka is located at
a) Bhadravati b) Sandur c) Raichur d) Kaiga
- 11 Biodiversity is a measure of variation at the _____ level
a) Genetic b) Species c) Ecosystem d) All of these
- 12 World Environment Day is celebrated on _____
a) 5th May b) 5th June c) 18th June d) 16th August
- 13 Mining means
a) To conserve minerals b) To check pollution
c) To extract minerals and ores d) None of these
- 14 Direct conversion of solar energy is attained by
a) Solar Photo volcanic system
b) Solar diesel hybrid system
c) Solar thermal system
d) Solar air heater
- 15 What % of its geographical area of a country should be under forest cover
a) 23% b) 43% c) 13% d) 33%
- 16 Hazardous Waste Management Act was enacted in India in the year
a) 1988 b) 1989 c) 1990 d) 1991
- 17 Which of these following elements is the case of e-waste?
a) Cadmium b) Beryllium c) Lead d) All of these
- 18 Remote sensing techniques make use of the properties of _____ emitted, reflected or diffracted by the sensed objects
a) Electric waves b) Sound waves
c) Electromagnetic waves d) Wind waves
- 19 The altitudinal distance of a geostationary satellite from the earth is about
a) 26,000km b) 30,000km c) 36,000km d) 44,000km
- 20 Montreal protocol is related to the
a) Food security b) Global warming
c) Sustainable development d) Ozone layer depletion
- 21 Disaster management includes _____
a) Mitigation b) Reconstruction c) Rehabilitation d) All of these
- 22 What is the health effects of fluoride in drinking water
a) Arthritis b) Diarrhea c) Anemia d) All of these

- 23 What is the permissible range of pH for drinking water as per Indian standards
 a) 6 – 9 b) 6 – 8.5 c) 6.5 – 8.5 d) 6.5 – 7.5
- 24 The infiltration of water into the subsurface is the
 a) Influent b) Effluent c) Discharge d) Recharge
- 25 Environmental (Protection Act) was enacted in the year
 a) 1986 b) 1992 c) 1984 d) 1974
- 26 What is the full form of NGO
 a) Non-Governmental Organization
 b) Non-Governance Organizations
 c) No- Governance Organizations
 d) Null – Governmental organizations
- 27 The primary cause of acid rain around the world is
 a) CFC b) SO₂ c) CO d) O₃
- 28 Bhopal Gas Tragedy caused due to leakage of
 a) Methyl ISO Cyanate (MIC) b) Sulphur dioxide
 c) Mustered gas d) Methane
- 29 Deforestation can
 a) Increase the rainfall b) Increase soil fertility
 c) Introduce silt in the river d) None of these
- 30 The word Environment is derived from
 a) Greek b) French c) Spanish d) English
- 31 GIS uses the information from which of the following sources
 a) Non-Spatial Information System
 b) Spatial Information System
 c) Global Information System
 d) Position Information System
- 32 EIA can be expanded as
 a) Environment and Industrial Act
 b) Environmental and Impact Activities
 c) Environmental Impact Assessment
 d) Environmental Impact Activity
- 33 ISO 14000 standards deals with
 a) Pollution management b) Risk management
 c) Environmental management d) None of these
- 34 Which of the following represents India in ISO
 a) PFRDA b) FSSAI c) BIS d) BCCI
- 35 Which of the following is having high population density
 a) India b) China c) USA d) Western Europe
- 36 Environment education is targeted to
 a) General public
 b) Professional social groups
 c) Technical and Scientists
 d) All of the above



- 37 Discharge of municipal waste cause
 a) Depletion of dissolved oxygen
 b) Destroy aquatic life
 c) Impair biological activity
 d) All of the above
- 38 _____ is are referred to a Earth's lungs
 a) Forests b) Carbon cycle c) Water sources d) Miner
- 39 Solid waste is best managed through
 a) Incineration b) Open dumping c) Sanitary landfill d) Composting
- 40 Love canal tragedy is attributed to
 a) Soil pollution b) Hazardous waste c) Air pollution d) None of these
- 41 The main cause of damage to Taj Mahal is _____
 a) Water pollution b) Soil pollution c) Acid rain d) Fog
- 42 Reducing the amount of future climate change is called.
 a) Mitigation b) Geo-engineering c) Adaptation d) None of these
- 43 Ozone layer is at a height of _____ above the Earth's surface
 a) 19 to 48m b) 19 to 480m c) 19 to 48km d) 190 to 480km
- 44 Which ministry is mainly responsible for research and development in renewable energy sources such as wind, power small hydro, biogas and solar power
 a) Human Resource Development
 b) Agriculture and Famous welfare
 c) Ministry of new and Renewable energy
 d) Health and Family welfare
- 45 The OTEC is an energy technology that converts
 a) Energy in large fides of ocean to generate electricity
 b) Energy in ocean waves to generate electricity
 c) Energy in ocean due to thermal gradient to generate electricity
 d) Energy in the fast moving ocean currents to generate electricity
- 46 In a Lake, phytoplankton grow in abundance in
 a) Littoral zone b) Limnetic zone c) Profundal zone d) Benthic region
- 47 The prescribed limits of noise in residential area during day is
 a) 55dB b) 45dB c) 60dB d) 50dB
- 48 The maximum allowable concentration of fluorides in drinking water
 a) 3mg/L b) 2mg/L c) 2.5mg/L d) 1.5mg/L
- 49 The color code of plastic bag for disposing microbial laboratory culture waste
 a) Red b) Black c) Blue d) White
- 50 The hazardous pollutant released from batteries is
 a) Arsenic b) Cobalt c) Barium d) Cadmium

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Sixth Semester B.E. Degree Examination, Dec.2023/Jan.2024 Applied Geotechnical Engineering

Time: 3 hrs.

Max. Marks: 100

*Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. IS 6403 is permitted.*

Module-1

- 1 a. What are geophysical methods? Explain seismic refraction method with neat sketch. (08 Marks)
- b. Discuss the necessity of subsoil exploration. Mention the stages involved in it. (06 Marks)
- c. Determine the area ratio for the following details and state type of sampler. Outer diameter of cutting edge is 80mm, wall thickness is 1.7mm. Comment on the result. (06 Marks)

OR

- 2 a. What is a bore hole log? List the information recorded in it. (05 Marks)
- b. What is stabilization of bore holes? Explain any two methods. (08 Marks)
- c. Establish the location of ground water in a clayey stratum. Water in the bore holes has bailed out to a depth of 10.5m below ground surface and the rise of water was recorded at 24 hour interval as follows: $h_1 = 0.63m$, $h_2 = 0.57m$ and $h_3 = 0.51m$. (07 Marks)

Module-2

- 3 a. What is Newmark's influence chart and also describe construction procedure for Newmark's influence chart. (08 Marks)
- b. Explain the following: (04 Marks)
 - i) Primary consolidation settlement.
 - ii) Secondary consolidation settlement.
- c. A concentrated load of 3000kN acts on the surface of a homogeneous soil mass of large extent. Find the stress intensity at a depth of 10m: (08 Marks)
 - i) Directly under the load
 - ii) At a horizontal distance 7.5m

Use Boussinesq's equations.

OR

- 4 a. Explain the terms: (08 Marks)
 - i) Contact pressure
 - ii) Uniform settlement
 - iii) Differential settlement
 - iv) Angular distortion.
- b. Explain methods to reduce settlement in buildings. (06 Marks)
- c. The circular foundation of 18m diameter transmits to the soil a uniform contact pressure of $300kN/m^2$ at a 3m depth. Determine the immediate settlement under the centre of the foundation. Take $E_s = 58MN/m^2$, $\mu = 0.4$, $\gamma = 20kN/m^3$ and influence factor = 1.0 (flexible footing at the centre). (06 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

Module-3

- 5 a. List and enumerate types of failures in finite slopes. (07 Marks)
 b. Explain the causes for slope failure. (05 Marks)
 c. A retaining wall with a smooth vertical back is 6m high and retains cohesionless soil with a bulk unit weight of 18kN/m^3 and $\phi = 30^\circ$. The top of the soil is level with the top of the wall horizontal. If the soil surface carries a uniformly distributed load of 5kN/m^2 . Determine using Rankine's theory, the total active earth thrust and draw the active earth pressure distribution diagram. (08 Marks)

OR

- 6 a. Explain Swedish circle method of slices of stability analysis for slopes. (07 Marks)
 b. Define with neat sketches at rest, active and passive earth pressure. (07 Marks)
 c. An embankment is to be constructed with $C = 30\text{kN/m}^2$, $\phi = 20^\circ$, $\gamma = 18\text{kN/m}^3$, factor of safety = 2 and height is 10m. Estimate the required side slope using Taylor's stability number.

Slope angle	90	75	60	45	30	20	10
S_n	0.182	0.134	0.097	0.062	0.025	0.005	0

(06 Marks)

Module-4

- 7 a. List the advantages and disadvantages of standard penetration test. (04 Marks)
 b. Explain shallow foundation and its types with a neat sketch. (08 Marks)
 c. A square foundation is $1.5\text{m} \times 1.5\text{m}$ in plan corresponding to the friction angle of soil supporting foundation N_c , N_q and N_γ are respectively 17.7, 7.4 and 5.0 and $c = 15.5\text{kN/m}^2$. The unit weight of soil is 17.8kN/m^3 . Determine the allowable gross load on the foundation with factor of safety 4. The depth of foundation is 1m and general shear failure occur in soil. (08 Marks)

OR

- 8 a. List the factors affecting bearing capacity of soil in both cohesive and cohesionless soils. (06 Marks)
 b. Define the following: i) General failure ii) Local shear failure iii) Punching failure. (06 Marks)
 c. A $2\text{m} \times 2\text{m}$ footing is located at a depth of 1.5m from ground surface in sand. The shear parameters are $C = 0$ and $\phi = 36^\circ$. Determine ultimate bearing capacity of soil if
 i) Water table is well below the foundation level.
 ii) Water table is at base of footing.
 iii) Water table is at the ground surface unit weight of soil above water table = 18kN/m^3 and saturated soil is 20kN/m^3 . Take $N_c = 50.5$, $N_q = 37.7$, $N_\gamma = 48.0$. (08 Marks)

Module-5

- 9 a. What is negative skin friction? Under what situation it occurs. (05 Marks)
 b. Explain classification of piles based on function and based on materials. (08 Marks)
 c. A concrete pile 300mm diameter is driven into a homogeneous consolidated clay deposit $C_u = 40\text{kN/m}^2$ and $\alpha = 0.7$. If the embedded length is 10m, calculate the safe load. Take factor a safety = 2.5. (07 Marks)

OR

- 10 a. Explain the determination of single loaded pile capacity for cohesive soil as per IS code by static formula. (07 Marks)
 b. Write a short note on settlement of piles. (06 Marks)
 c. A pile is driven in a uniform clay of large depth. The clay has an unconfined compression strength of 80kN/m^2 . The pile is 350mm diameter and 7m long. Determine the safe frictional resistance of the pile, assuming a factor of safety of 3. Assume the adhesion factor $\alpha = 0.7$. (07 Marks)

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Sixth Semester B.E. Degree Examination, Dec.2023/Jan.2024 Hydrology and Irrigation Engineering

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- With a neat sketch, explain the engineering representation of hydrological cycle. (10 Marks)
 - Explain how consistency of rainfall data is checked using double mass curve technique. (05 Marks)
 - Briefly explain: i) Forms of precipitation ii) Rainfall hyetograph. (05 Marks)

OR

- Define precipitation, list its types and explain with neat sketch how its amount is measured using Symon's raingauge. (10 Marks)
 - A catchment as six rain gauge stations in an year the annual rainfall is recorded as follows:

Station	A	B	C	D	E	F
Rainfall (mm)	82.6	102.9	180.3	110.3	98.8	136.7

For 10% error in the estimation of mean rainfall. Calculate the optimal number of stations in catchment. (10 Marks)

Module-2

- What is evaporation? Explain the factors affecting evaporation. (10 Marks)
 - What are the factors affecting the infiltration? Explain with neat sketch double ring infiltrometer. (10 Marks)

OR

- Explain the process of methods of control evaporation from lakes. (10 Marks)
 - Explain what is evapo-transpiration and also factors affecting evapo-transpiration. (10 Marks)

Module-3

- Define Run-off. Explain factors affecting runoff. (10 Marks)
 - Explain with a neat sketch, components of storm hydrograph. (10 Marks)

OR

- Explain Rainfall-Runoff correlation analysis. (06 Marks)
 - Define unit hydrograph. Explain with a neat sketch, the derivation of unit hydrograph. State its assumption application and limitation. (10 Marks)
 - Given the ordinates of a 4-hr unit hydrograph as below, derive the ordinates of a 12-h unit hydrograph for the same catchment.

Time (hr)	0	4	8	12	16	20	24	28	32	36	40	44
Ordinates of 4h UH (m ³ /sec)	0	20	80	130	150	130	90	52	27	15	05	0

(04 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and/or equations written eg. 42+8 = 50, will be treated as malpractice.

Module-4

- 7 a. Define irrigation. List and explain benefits and ill effects of irrigation. (08 Marks)
 b. What are duty, delta and base period? Explain factors affecting duty of water. (08 Marks)
 c. Give relationship between duty, delta and base periods. (04 Marks)

OR

- 8 a. What is Irrigation efficiency? Define different efficiencies of irrigation water. (08 Marks)
 b. The gross command area was an irrigation project is 1.5 lakh-ha where 7500 ha are unculturable. The area of Kharif crop is 60,000 hectares and that of rabi is 40,000 hectares. The duty of Kharif is 3000 hectares/cumec and duty of rabi 4000 hectares/cumec. Find:
 i) The design discharge of canal assuming 10% transmission loss.
 ii) Intensity of irrigation for Kharif and Rabi. (12 Marks)

Module-5

- 9 a. What is canal? List its types and explain with neat sketch its classification based on alignment. (10 Marks)
 b. Explain different storage zones of reservoir with neat sketch. (10 Marks)

OR

- 10 a. Explain hydrological investigation of reservoir planning. List the points to be considered for selection of site for a reservoir. (10 Marks)
 b. The channel section is to be designed for the following data:
 Discharge $Q = 30$ cumecs
 Lacy's silt factor $f = 1$
 Side slope = $\frac{1}{2} H : 1V$
 Find also the longitudinal slope. (10 Marks)

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Sixth Semester B.E. Degree Examination, Dec.2023/Jan.2024

Ground Improvement Techniques

Time: 3 hrs.

Max. Marks: 100

- Note:** 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. Write neat and labelled sketches, where ever necessary.

Module-1

- 1 a. Explain briefly the formation process of different types of Rocks and Soils. (10 Marks)
b. List and explain about the effect of compaction on Soil properties. (10 Marks)

OR

- 2 a. Write a brief descriptive note on any four types of soils found in India. (10 Marks)
b. List the different types of field compaction procedure and explain any two in brief. (10 Marks)

Module-2

- 3 a. With the help of neat diagrams, explain :
i) Single stage well point system
ii) Multi stage well point system (10 Marks)
b. Explain with neat sketch the concept of vertical drains. (10 Marks)

OR

- 4 a. Describe briefly the Electro – Osmosis dewatering method with help of a neat labelled diagram. (10 Marks)
b. Write an Explanatory note on Design of dewatering systems taking into consideration the pipeline. Effect of Dewatering. (10 Marks)

Module-3

- 5 Write short notes on:
a) Sandwich technique
b) Stabilization using chlorides
c) Stabilization using Lignins
d) Stabilization using hydroxides (20 Marks)

OR

- 6 a. In detail, explain the effect of cement stabilization on the following properties of soils.
i) Permeability
ii) Swelling and Shrinkage
iii) Strength and deformation properties (10 Marks)
b. Write short notes on :
i) Bitumen stabilization
ii) Fly ash stabilization (10 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

Module-4

- 7 a. List and explain the effects of grouting on soils. (10 Marks)
b. Explain briefly about (10 Marks)
i) Vibroflotation ii) Stone columns.

OR

- 8 a. List and explain in detail, the different applications of grouting. (10 Marks)
b. Briefly explain: i) Heavy tamping ii) Sand compaction piles. (10 Marks)

Module-5

- 9 a. Write short note on : (10 Marks)
i) Soil nailing and its applications
ii) Micro piles and its applications
b. List the different types of Geosynthetics and explain in detail about any two types. (10 Marks)

OR

- 10 a. Explain in detail, about the following properties of Geosynthetics. (10 Marks)
i) Geometrical aspects
ii) Mechanical properties
iii) Filtration and Fluid transmission
iv) Durability aspects
b. Briefly describe the concept of (10 Marks)
i) Thermal methods of ground improvement
ii) Gabions and Crib walls.

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Sixth Semester B.E. Degree Examination, Dec.2023/Jan.2024 Traffic Engineering

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- a. List the different road users characteristics and explain the concept of PIEV theory. (10 Marks)
b. With a flow diagram, explain sustainable approach related to transport planning. (10 Marks)

OR

- a. Discuss various urban traffic problems in India. List some remedial measures also. (10 Marks)
b. A vehicle of mass 1800kg has to accelerate at $2M/sec^2$ from a speed of 12kmph to 22kmph in the first gear. The gradient is +1.2% and the coefficient of rolling resistance are 0.025. The frontal area and co-efficient of air resistance are $2.38m^2$ and 0.37 respectively. The transmission and rear gear ratio are 2.85:1 and 3.71:1 respectively. The radius and deformation factor of tyres are 0.35 and 0.945m respectively. Determine the engine horse power and speed of engine if transmission efficiency is 0.88. (10 Marks)

Module-2

- a. Explain briefly speed and delay study by moving car observer method. List the advantages of this method. (10 Marks)
b. Explain the preventive measure to reduce accidents. (10 Marks)

OR

- a. Mention the various applications of O and D study. Explain road side interview method of collecting O and D data. (10 Marks)
b. Spot speed studies were carried out on a certain stretch of a road highway and the consolidated data collected are given below:

Speed range (kmph)	Number of vehicles observed	Speed range (kmph)	Number of vehicles observed
0 to 10	12	50 to 60	255
10 to 20	18	60 to 70	119
20 to 30	68	70 to 80	43
30 to 40	89	80 to 90	33
40 to 50	204	90 to 100	09

Determine:

- Upper and lower values of speed limit for regulation
- Design speed for checking the geometric design element of the highway. (10 Marks)

Module-3

- a. List the advantages and disadvantages of traffic signals. (10 Marks)
b. Discuss briefly the different types of road Markings. (10 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg. 42+8 = 50, will be treated as malpractice.

OR

- 6 a. Mention various classification of traffic signs. Explain any two of them with neat sketches. (10 Marks)
- b. The average normal flow on cross roads 'A' and 'B' during design period are 400PCU and 250PCU per hour. The saturation flows are 1250PCU and 1000PCU per hour respectively. The all red time required for pedestrian crossing is 12 seconds. Design a two phase signal by Webster's method. (10 Marks)

Module-4

- 7 a. Explain various design factors of road lighting. (10 Marks)
- b. Explain in detail the causes for road accidents. (10 Marks)

OR

- 8 a. Explain the measures to control traffic noise. (10 Marks)
- b. Write a short notes on:
- Promotion of non motorized transport
 - Measures for controlling air pollution. (10 Marks)

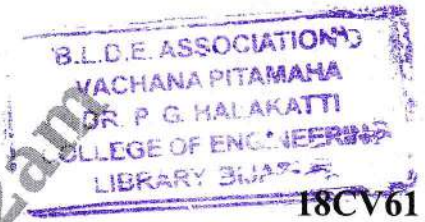
Module-5

- 9 a. List the techniques commonly adopted in Travel Demand Management (TDM). Explain any one in detail. (10 Marks)
- b. What do you mean by "Area traffic control"? Mention its objectives, indicating the types of methods adopted in traffic control. (10 Marks)

OR

- 10 a. Explain the necessity and applications of Intelligent Transport System (ITS). (10 Marks)
- b. Discuss the advantages and disadvantages of one way streets. (10 Marks)

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Sixth Semester B.E. Degree Examination, Dec.2023/Jan.2024

Design of Steel Structural Elements

Time: 3 hrs.

Max. Marks: 100

- Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. Use of IS 800:2007, Steel tables or SP6(1) are permitted.
3. Assume missing data suitably.*

Module-1

- 1 a. State any five advantages and three disadvantages of using steel structures. (08 Marks)
- b. Determine the shape factor of a T section having a flange width 200mm and 20mm thick with a web of 10mm thick and 180mm depth. (07 Marks)
- c. Mention the classification of sections as per IS800:2007. (05 Marks)

OR

- 2 a. Define : i) Plastic hinge ii) Collapse load iii) Plastic moment. (03 Marks)
- b. What are Rolled Steel Sections? Mention any six shapes used as structural elements with sketches. (07 Marks)
- c. Find out collapse load for a propped cantilever subjected to a uniformly distributed load/unit length. The plastic capacity of the beam is M_p . (10 Marks)

Module-2

- 3 a. What are the advantages and disadvantages of welded connection? (06 Marks)
- b. Explain the advantages of high strength friction grip bolts. (04 Marks)
- c. Design a bolted connection for a lap joint of plate thickness 10mm and 12mm to carry a factored load of 150 kV. Use M_{16} and 4.6 grade bolt. Assume the bolts as fully threaded. (10 Marks)

OR

- 4 a. Explain various modes of failures of bolted connections with neat sketch. (06 Marks)
- b. Explain the common defects in the welded connection. (04 Marks)
- c. Design welded connection for two angles ISA 100 × 75 × 8 mm connected to 10mm gusset with longer legs at its extremities. Design weld for full strength of the member. Assume shop welding size of fillet weld as 6mm. (10 Marks)

Module-3

- 5 Design a compression member using a double channel section back to back to carry a factored load of 1500 kV. The length of the column is 4.5m with one end fixed and other end hinged. Design the battens. (20 Marks)

OR

- 6 a. Explain Laced and Battened columns with sketches. (08 Marks)
- b. Determine the design strength of a column section ISHB350@67 kg/m. The column is 3m height with one fixed and other end hinged. Take $f_y = 250 \text{ N/mm}^2$. (12 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and/or equations written eg. 42+8 = 50, will be treated as malpractice.

Module-4

- 7 a. What is lug angle? Explain briefly with a sketch. (06 Marks)
b. A single unequal angle ISA 100×75×6 mm is connected to a 10mm thick gusset plate with six 16mm diameter bolts to transfer tension. Determine design tensile strength if longer legs are connected to gusset. Assume pitch and edge distance of 40mm each. (14 Marks)

OR

- 8 a. Briefly explain types of column bases. (06 Marks)
b. Design a slab base for a column ISHB 300@58.8 kg/m subjected to a service load of 1500 kN. The grade of concrete for pedestal is M20 and SBC of soil is 180 kN/m². Design slab base and concrete base with welded connection. (14 Marks)

Module-5

- 9 Design a suitable joist for a roof of a hall 7.5×12 m consists of 100mm thick RC slab supported on steel beams at 3 m apart. The finishing may be taken as 1 kN/m² and live load is taken as 4 kN/m². Self weight of the beam as 1 kN/m. (20 Marks)

OR

- 10 Simply supported beam ISMB 350 @ 52.4 kg/m is used over a span 5m. The beam carries an Udl live load of 20 kN/m and dead load of 15 kN/m. The beam is laterally supported throughout. Check the safety of the beam. (20 Marks)

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Seventh Semester B.E. Degree Examination, Dec.2023/Jan.2024 Quantity Surveying and Contract Management

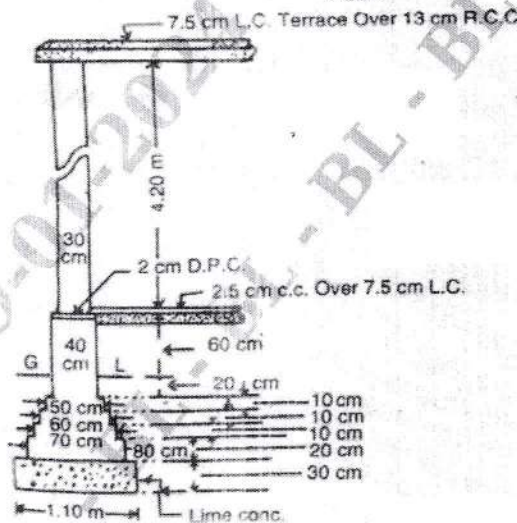
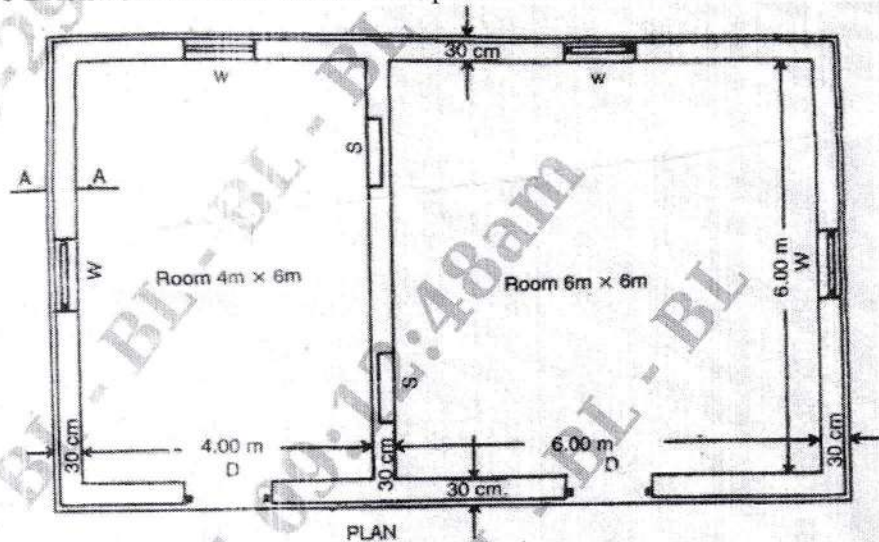
Time: 3 hrs.

Max. Marks: 100

*Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. Assume missing data (if any) suitably.*

Module-1

- 1 The detail of two room building are shown in Fig.Q.1. Estimate quantities and cost of the following items of work:
- i) Earthwork excavation in foundation at 300 Rs/m³.
 - ii) Lime concrete in foundation at 2500/m³
 - iii) First class Brickwork in CM (1:6) in foundation and plinth at 1800/m³.
 - iv) First class Brickwork in Lime mortar in superstructure at Rs.2000/m³.
- (20 Marks)



- All Walls are of same section
Lintels over Doors, Windows and
Shelves are 15 cm thick R.B.

Doors D-1.20 m × 2.10 m
Windows W-1.00 × 1.50 m
Shelves S-1.00 m × 1.50 m

CROSS SECTION OF WALL ON A-A

Fig.Q.1

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg. 42+8 = 50, will be treated as malpractice.

OR

- 2 What are the different types of Estimates? Explain any four different types of Estimates. (20 Marks)

Module-2

- 3 The details of man hole is as shown in Fig.Q.3. Estimate the quantities for the following item of work:
- Earthwork excavation in foundation
 - Cement concrete 1:3:6 floor and foundation
 - First class brick work with CM 1:4
 - 20mm thick cement plaster 1:3 in floor and channel.
- (20 Marks)

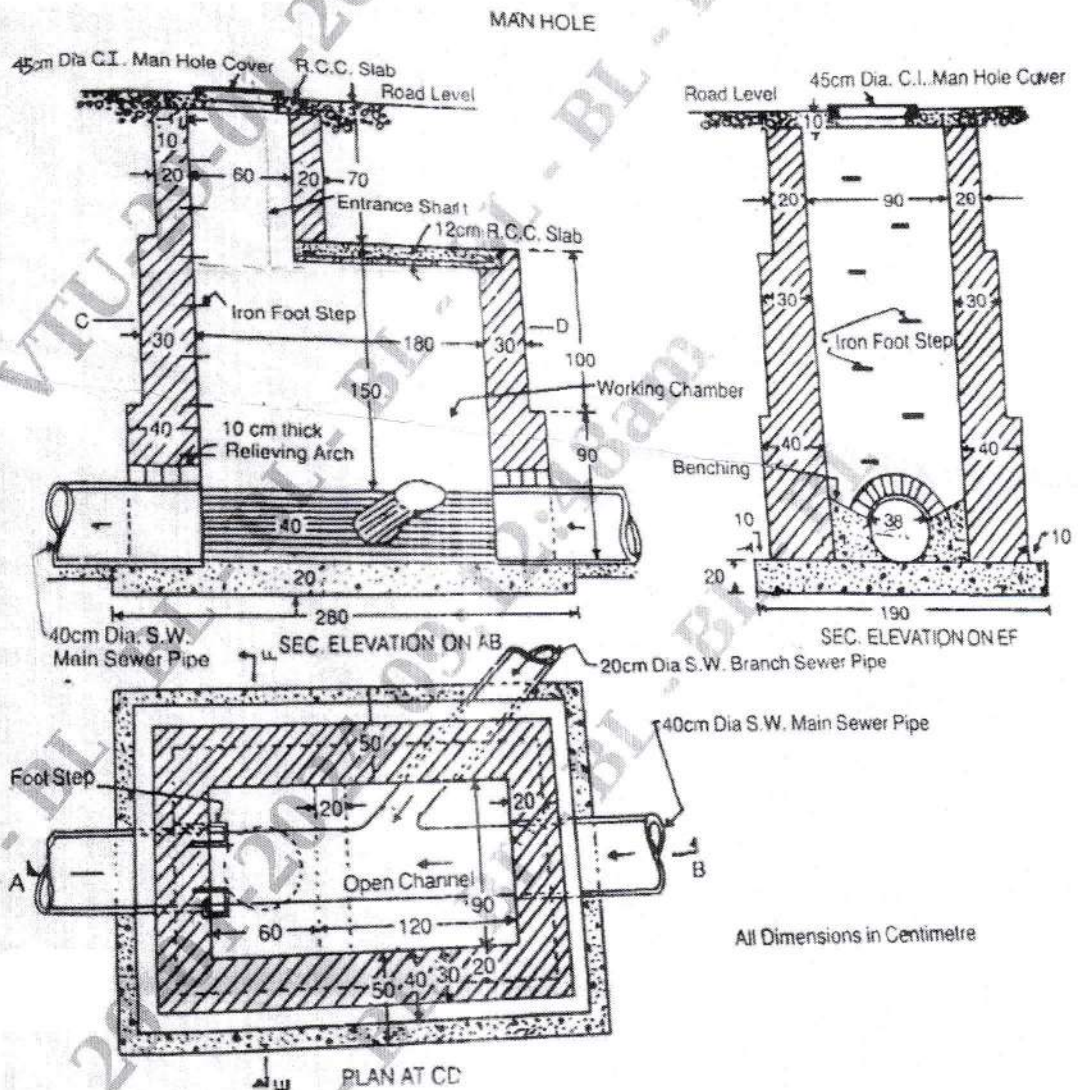


Fig.Q.3

OR

- 4 Estimate the quantity of earthwork in banking and cutting by mid sectional area method for a portion of road from the following data:

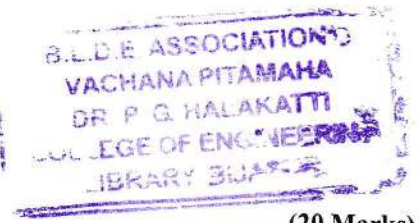
Distance in 'm'	0	100	200	300	400	500	600	700	800	900	1000	1100	1200
R.L of ground	114.00	114.60	115.00	115.20	116.10	116.50	118.00	118.25	118.10	117.80	117.75	117.80	119.20
R.L of formation	115.0	Upward gradient of 1 in 200 upto 600m						Downward gradient of 1 in 400					

Formation width of road is 10m. Side slope 2:1 in banking and 1.5:1 in cutting. (20 Marks)

Module-3

- 5 Write detailed technical specification for the following:

- 12mm thick plastering for walls with CM1:6
- First class brick masonry for super structure CM1:4
- Earthwork excavation for foundation
- Mosaic/Terrazo flooring.



(20 Marks)

OR

- 6 Carryout the rate analysis for the following:

- Cement concrete CC 1:2:4 for RCC works.
- R.C.C. $1:1\frac{1}{2}:3$ for roof slab.
- 1st class BBM in CM1:6 for superstructure.
- 20mm thick DPC with CM1:5.

(20 Marks)

Module-4

- 7 What are the different types of contract? Explain any four types of contracts? (20 Marks)

OR

- 8 Explain the procedure of tendering and award of works in civil engineering projects. (20 Marks)

Module-5

- 9 Write short notes about any four of the following:

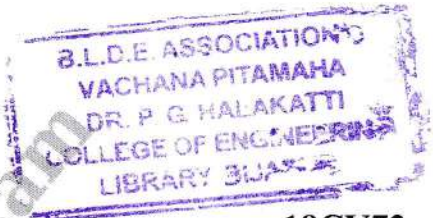
- Performance security
- Breach of contract
- Mobilization and equipment advances
- Contract management
- Liquidated damages.

(20 Marks)

OR

- 10 a. Explain the methods of valuation. (10 Marks)
 b. A building of replacement value of about Rs.7,00,000/- stands on a main road on a leasehold plot. The ground rent per annum is Rs.2950/-. The building is of R.C.C. framed structure type. It is estimated that the building will have a future life of 70 years. The rent of the building is Rs.4000/- per month. The taxes payable are 18% of the gross rent and insurance premium is 0.5% of the gross rent. Assuming suitable figures for other items of the usual outgoings. Determine the capitalized value of the property on the basis of a 5% net yield. The S.F coefficient for the replacement of the capital is 70 years at 3% is 0.0043. (10 Marks)

CBCS SCHEME



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18CV72

Seventh Semester B.E. Degree Examination, Dec.2023/Jan.2024 Design of RCC and Steel Structure

Time: 3 hrs.

Max. Marks: 100

- Note: 1. Answer any TWO full questions, choosing ONE full question from each module.
2. Use of IS-456, IS-800, SP-16, SP(6) – steel tables are allowed.

Module-1

- 1 Design RCC rectangular combined footings for two columns which are 3.6 m apart carrying a load of 1000 kN and 1500 kN. Sizes of column are 400 mm × 400 mm and 600 × 600 mm. Width of footing is 1.8 m SBC of soil is 280 kN/m². M20 concrete and Fe415 steel is used. Assume beam and slab type combined footing, sketch the details of reinforcement. (50 Marks)

OR

- 2 Design a cantilever retaining wall to retain an earth embankment with a horizontal top 3.50 m above ground level. The unit weight of back fill is 18 kN/m³. Angle of internal friction $\phi = 30^\circ$, SBC of soil = 180 kN/m². Take coefficient of friction between soil and concrete = 0.55. Adopt M20 grade concrete and Fe415 grade steel. Depth of foundation = 1.0 m. (50 Marks)

Module-2

- 3 The centre line of a roof truss is as shown in Fig.Q3. The magnitude and nature of forces under service conditions are:
Top chord members = 120 kN compression
Bottom chord members = 100 kN Tension
Interior members = 60 kN Tension and 50 kN compression,
For all the interior members use similar single angle sections. Design all the members and joints using M16 turned bolts of grade 4.6. Also design bearing plate, base plate and anchor bolts to connect the truss to an RCC column 300 mm × 300 mm of M20 grade concrete. (50 Marks)

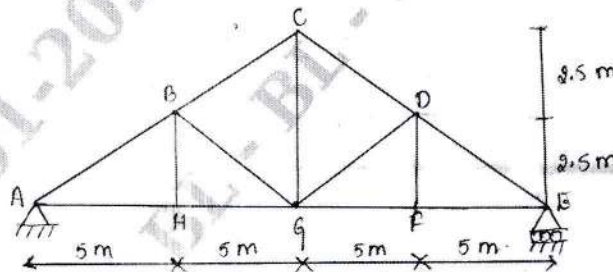


Fig.Q3

(50 Marks)

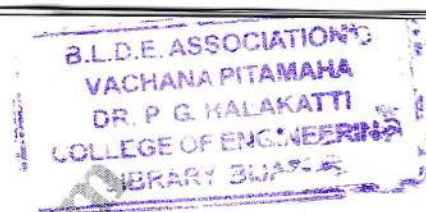
OR

- 4 Design a plate girder for an effective span 14 m. Load on the girder consist of UDL 45 kN/m in addition to two point loads each of magnitude 400 kN placed at a distance of 3m, on either side of mid span point of girder. Design Mid span cross section curtailment of flange, intermediate stiffness and end bearing stiffness.

Draw sketch showing detail of longitudinal section cross section at mid span and support (50 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

CBCS SCHEME



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18CV732

Seventh Semester B.E. Degree Examination, Dec.2023/Jan.2024

Air Pollution and Control

Time: 3 hrs.

Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.

2. Assume any missing data suitably.

Module-1

- 1 a. Define Air Pollution. Explain the classification and sources of air pollutants. (10 Marks)
b. Briefly explain the effects of air pollution on human health. (10 Marks)

OR

- 2 a. Briefly explain the effects of air pollution on vegetation and materials. (10 Marks)
b. Write short notes on :
(i) Types of Inversion (ii) Photochemical Smog (10 Marks)

Module-2

- 3 a. With neat sketches, explain different types of plume behavior. (10 Marks)
b. Explain the methods for measurement of meteorological variables. (10 Marks)

OR

- 4 a. Define wind rose with a neat sketch explain how a wind rose is plotted. (10 Marks)
b. Determine the plume rise from the following data:
(i) Physical height of stack = 180 m
(ii) Inside diameter of stack = 0.95m
(iii) Wind velocity = 2.75m/sec
(iv) Air temperature = 20°C
(v) Barometric temperature = 1000 mb
(vi) Stack gas velocity = 11.12m/sec
(vii) Stack gas temperature = 160°C (10 Marks)

Module-3

- 5 a. Explain in brief monitoring and analysis of following air pollutants:
(i) PM₁₀ (ii) SO_x (10 Marks)
b. What is meant by air sampling? Explain non-isokinetic and isokinetic sampling. (10 Marks)

OR

- 6 a. Explain in brief monitoring and analysis of NO_x and PM_{2.5}. (10 Marks)
b. Explain Gaussian dispersion model and write the assumption of the model. (10 Marks)

Module-4

- 7 a. Write short notes on:
(i) Settling chambers (ii) Cyclone separators. (10 Marks)
b. With the help of neat sketch, explain the working principle of Electro Static Precipitators (ESP). (10 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
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18CV732

OR

- 8 a. List the different types of scrubbers and explain any two with neat sketch. (10 Marks)
b. With a neat sketch, explain the operation of Fabric filter. (10 Marks)

Module-5

- 9 a. Explain briefly the types of emission in automobiles and main approaches to minimize exhaust emissions. (10 Marks)
b. Define Noise Pollution. Explain the effects and its control measures. (10 Marks)

OR

- 10 Write short notes on : (20 Marks)
(i) Acid Rain
(ii) Environmental Law and Act
(iii) Green house effect.

CBCS SCHEME

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18CV745

Seventh Semester B.E. Degree Examination, Dec.2023/Jan.2024 Urban Transport Planning

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- 1 a. What is Urbanisation? What are the advantages and disadvantages of Urbanisation? (10 Marks)
b. List and explain various Urban transportation problems. (10 Marks)

OR

- 2 a. Briefly explain various steps involved in Urban transportation planning process. (10 Marks)
b. Explain various types of Co-ordination in Passenger transport. (10 Marks)

Module-2

- 3 a. Define External Cordon Line. What factors are considered while selecting external Cordon line? (06 Marks)
b. What are various points to be considered when dividing the Urban area into zones? (06 Marks)
c. Briefly explain the procedure for conducting home interview surveys. What are the advantages and disadvantages of Home interview surveys? (08 Marks)

OR

- 4 a. Explain Registration number plate survey and Tag on vehicle survey method with their advantages and disadvantages. (10 Marks)
b. List and explain inventory of transport facilities. (10 Marks)

Module-3

- 5 a. Explain Category analysis. What are the advantages and disadvantages of this method? (10 Marks)
b. The following data is collected for a town :

Zone	1	2	3	4	5	6	7
Population in Thousand	25	20	28	18	19	21	22
Trips generated in Hundreds	18	15	20	13	14	16	17

Develop a linear regression model for trips generated from a zone and compute the coefficient of correlation. Predict the expected trip for a zone with population 50000.

(10 Marks)

OR

- 6 a. List the various growth factor methods of trip distribution. Explain any one method in detail with the advantages and disadvantages. (10 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

- b. Calculate the future trip distribution based on Furness method (up to two iteration) from the following data :

O	D	Present trips				Future Trips
		1	2	3	4	
1		10	20	15	18	140
2		21	16	17	14	150
3		30	21	25	27	200
4		10	9	16	13	100
Future Trips		150	110	170	160	

(10 Marks)

Module-4

- 7 a. Explain : i) Gravity model ii) Intervening opportunity model. (10 Marks)
 b. Distribute 650 work trips from zone – 3 to zones 1, 2, 3, 4, and 5 from the data given below.

Zone No	Total work trip attractions	Travel time in minutes	Travel time factor
1	1080	20	6
2	531	7	29
3	76	5	45
4	47	10	18
5	82	25	4

(10 Marks)

OR

- 8 a. Define Modal Split. Explain in brief factors affecting modal split. (10 Marks)
 b. With a neat flow diagram, explain pre distribution modal split. What are the advantages and disadvantages of this method? (10 Marks)

Module-5

- 9 a. Define Traffic assignment. What are the applications of traffic assignment? (10 Marks)
 b. Write short notes on :
 i) All or nothing assignment technique.
 ii) Capacity restraint assignment. (10 Marks)
- 10 a. With a neat flow chart, explain the principle components of the Lowry model. (10 Marks)
 b. Discuss the points for the selection of Land use transport modal. (10 Marks)

CBCS SCHEME

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18CV81

Eighth Semester B.E. Degree Examination, Dec.2023/Jan.2024 Design of Pre-Stressed Concrete

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- 1 a. Define pre-stressed concrete. State its advantageous over reinforced concrete. (06 Marks)
b. Distinguish between pre-tensioning and post-tensioning methods. (08 Marks)
c. Explain the following:
i) Bonded and unbounded member
ii) Anchorage
iii) Stress at transfer. (06 Marks)

OR

- 2 a. Explain the following:
i) Hoyer's long line method ii) Freyssinet system of pre-stressing. (08 Marks)
b. A concrete beam of symmetrical I-section is used to support a super imposed load of 3kN/m over a span of 8m. It is pre-stressed by a cable carrying a force of 120kN at an eccentricity of 150mm at centre of the span of the section. The section details are top and bottom flanges are 250mm wide and 80mm thick, thickness of web is 80mm and overall depth is 450mm. Consider density of concrete as 24kN/m³. Determine the resultant stresses at midspan section for the following cases of loading:
i) Pre-stress + self weight ii) Pre-stress + self weight + live load. (12 Marks)

Module-2

- 3 a. List the various losses of pre-stress that occur in pre-tensioned and post-tensioned beams. (06 Marks)
b. A pre-tensioned concrete beam of rectangular C/S 150mm wide and 300mm deep is pre-stressed by 8 high tensile wires of 7mm diameter located at 100mm from the soffit of the beam. If the wires tensioned to a stress 1100 N/mm². Calculate the percentage of loss due to elastic deformation, shrinkage of concrete creep of concrete and relaxation of stress in steel. Take $M = 6$, shrinkage strain = 0.0003, creep coefficient = 2, stress relaxation in steel = 3%, $E_s = 210 \text{ kN/mm}^2$. (14 Marks)

OR

- 4 a. Explain the following:
i) Long and short term deflection in PSC beams.
ii) Factors effecting deflections of PSC beams. (08 Marks)
b. A concrete beam with rectangular C/S 300mm wide and 500mm deep is pre-stressed by 2 post tensioned cables of area 600mm² each. Initially stressed to 1600 N/mm². The cables are located at an eccentricity $e = 100\text{mm}$ through the length of the beam having a span of 10m. $E_s = 210\text{kN/mm}^2$ and $E_c = 38\text{kN/mm}^2$, density of concrete 24kN/m³
i) Neglecting all losses, find the deflection at centre of span where it is supporting its own weight.
ii) Allowing for 20% loss in pre stress, find the final deflection at the centre of span where it carries an imposed load of 18kN/m. (12 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and/or equations written eg, 42+8 = 50, will be treated as malpractice.

Module-3

- 5 a. Explain the assumptions in limit state of collapse. (08 Marks)
- b. A prestressed concrete beam rectangular in C/S 200mm wide and 500mm deep is prestressed by tendons having an area 600mm^2 located at 100mm from soffit of the beam. Given $f_{ck} = 40\text{N/mm}^2$ and $f_p = 1600\text{N/mm}^2$. Estimate the flexural strength of the beam for the following cases as per IS1343 code recommendation:
- If the beam is pre tensioned
 - If the beam is post tensioned with effective bond. (12 Marks)

OR

- 6 Design a pre-stressed concrete beam type-1 member to carry a super imposed load of 12kN/m over a simply supported span of 25m . The permissible stresses in compression for concrete at transfer and working are 14N/mm^2 and 12N/mm^2 respectively. Initial stress in pre-stressing cable is 1000N/mm^2 . Loss of pre-stress is 20% adopt Freyssinet cables of 12 wires of 5mm diameter. (20 Marks)

Module-4

- 7 a. Explain the modes of failure due to shear. (08 Marks)
- b. A pre-stressed concrete beam of rectangular C/S 120mm wide and 300mm deep is axially prestressed by a cable carrying an effective force of 180kN . The beam supports a total uniformly distributed load of 5 kN/m which includes self weight of the member. The span of beam is 10m . Compare the magnitude of the principal tension developed in the beam with and without the axial pre-stress. (12 Marks)

OR

- 8 The support section of a PSC beam 150mm wide and 300mm deep is to resist a shear of 100kN . The pre-stress at centroidal axis is 5N/mm^2 , $f_{ck} = 40\text{N/mm}^2$. The cover to tension reinforcement is 45mm. Check the section for shear and design suitable shear reinforcement $f_t = 1.5\text{N/mm}^2$. (20 Marks)

Module-5

- 9 a. Explain the stress distribution in end block. (08 Marks)
- b. The end block of a post tensioned pre-stressed concrete beam 300mm wide and 300mm deep is subjected to a concentric anchorage force of 832800N by a Freyssinet anchorage of area 11720mm^2 . Design and detail the anchorage reinforcement for the end block. (12 Marks)

OR

- 10 Explain the following:
- Freyssinet anchorage system
 - Grifford udall system
 - Thermo-electric pre-stressing
 - Chemical pre-stressing. (20 Marks)

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Eighth Semester B.E. Degree Examination, Dec.2023/Jan.2024 Pavement Design

Time: 3 hrs.

Max. Marks: 100

- Note:** 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. Use charts for data to solve problems.

Module-1

1. a. Briefly explain the pavement components. (06 Marks)
- b. Write the difference between highway pavement and airfield pavement. (06 Marks)
- c. A plate bearing test were conducted with 30cm plate dia on soil subgrade and over 15cm base course. The pressure yielded at 0.5cm deflection is 1.25kg/cm² and 4.0kg/cm² respectively. Design the pavement section for 4100kg wheel load with tyre pressure of 5kg/cm² for an allowable deflection of 0.5cm using Burmister's approach. (08 Marks)

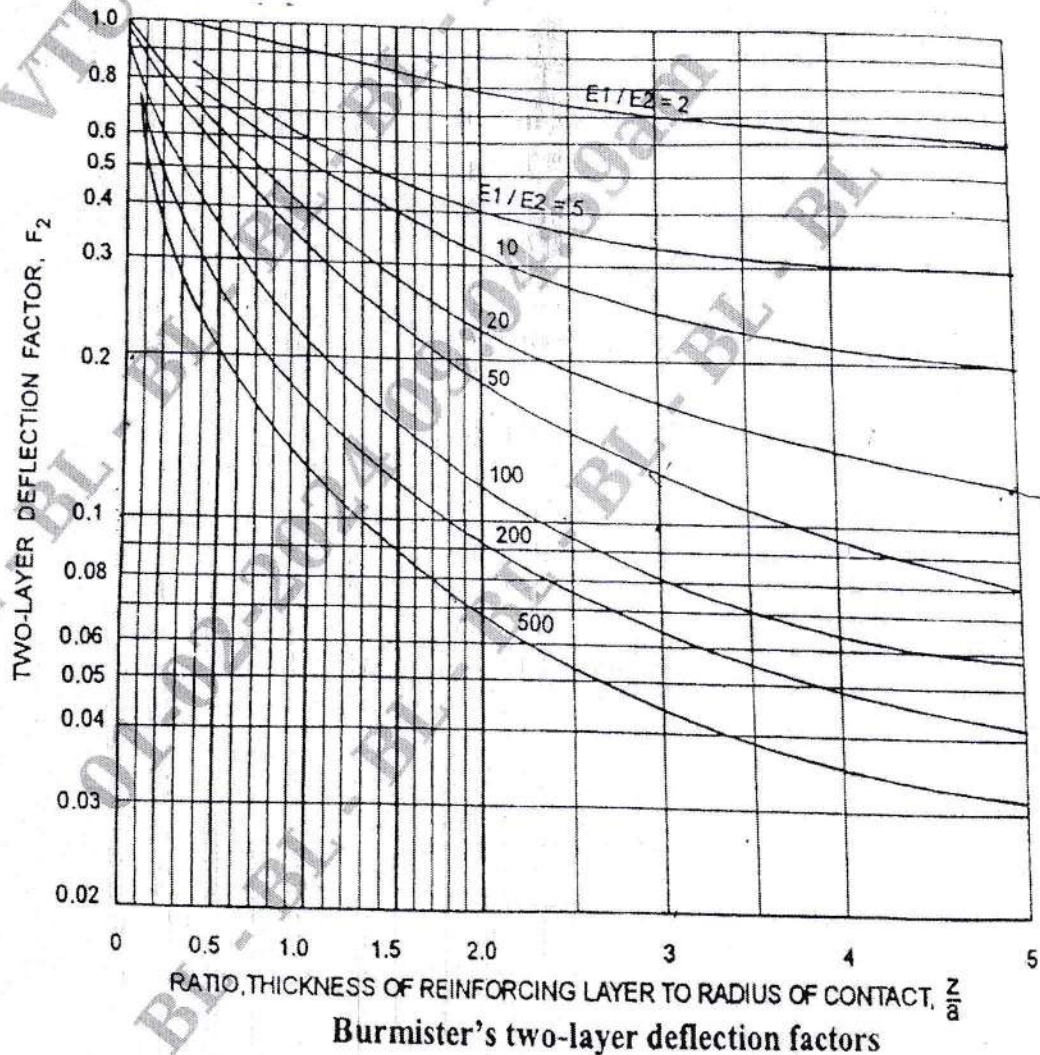
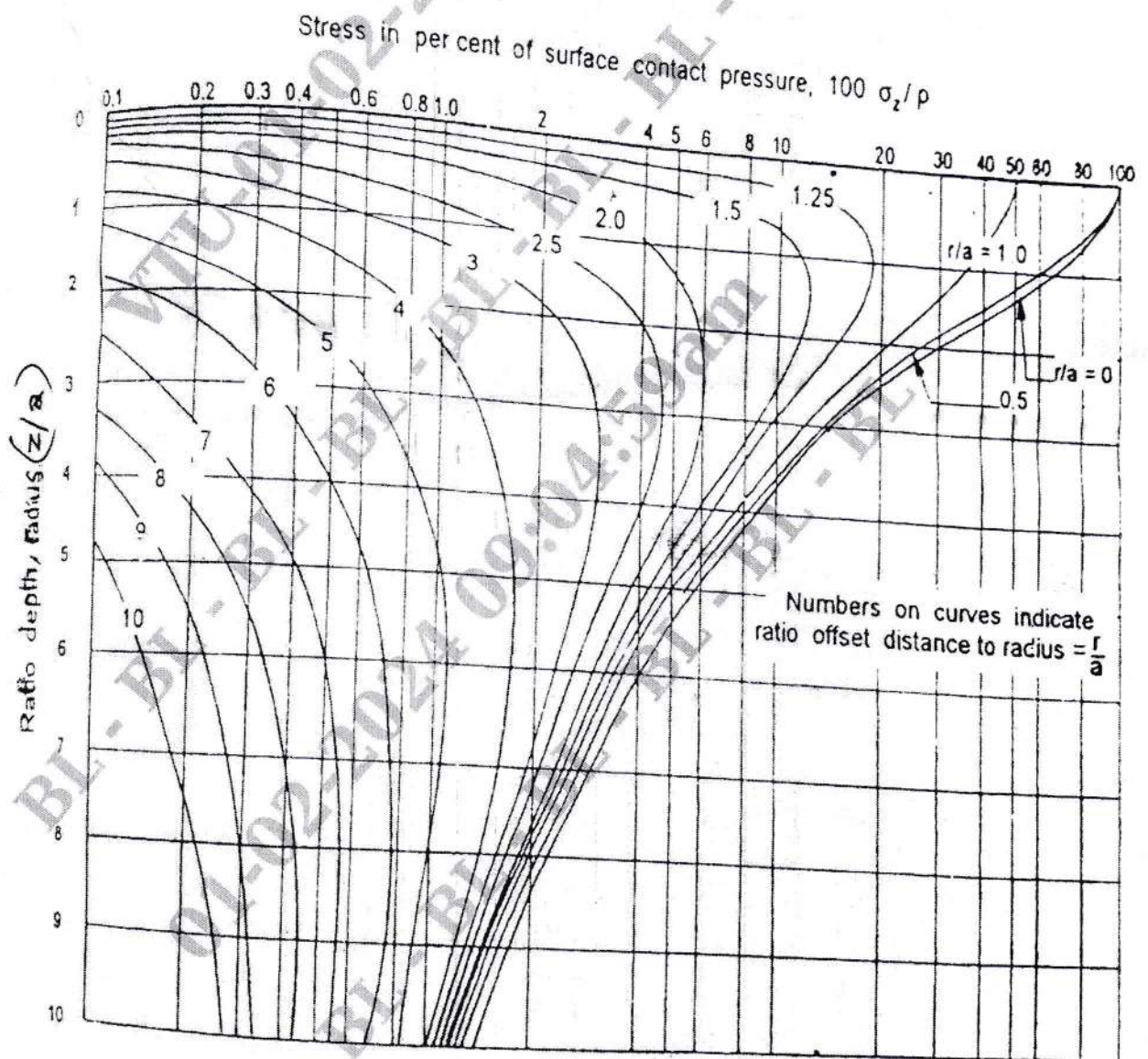


Fig.Q1(c)
1 of 6

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

OR

- 2 a. Compare the flexible pavements and rigid pavement. (06 Marks)
- b. Briefly explain the functions of subgrade, subbase, Base course, Surface course. (06 Marks)
- c. A circular load of radius 15cm with uniform contact pressure of 7.0kg/cm^2 is applied on the surface of a homogenous elastic mass. Determine the vertical stress under the centre of the load at a depth of 45cm from the surface. (08 Marks)

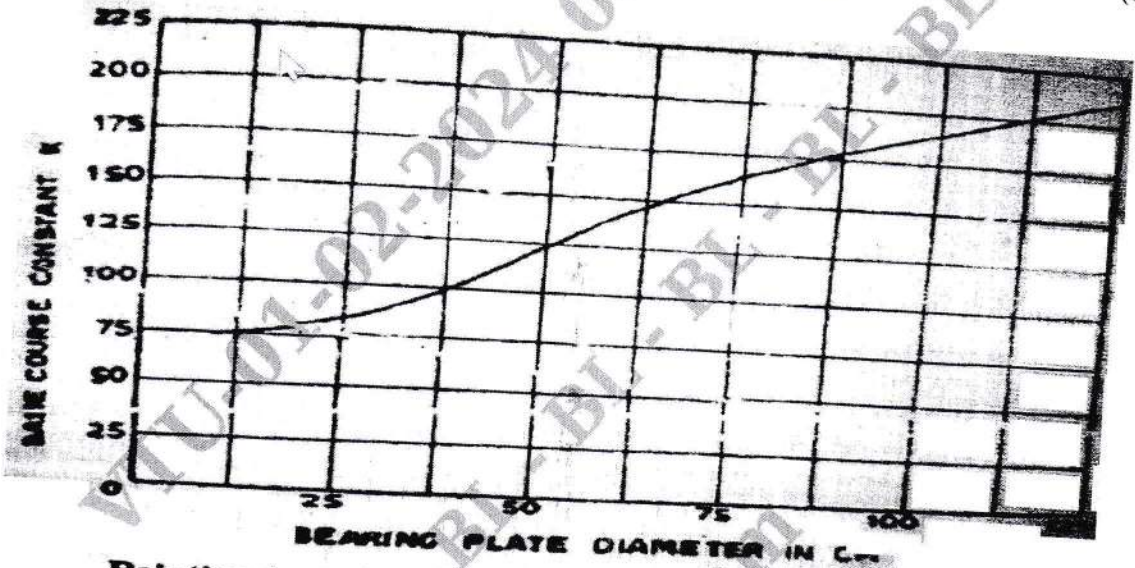


Vertical stress distribution chart (single layer)

Fig.Q2(c)

Module-2

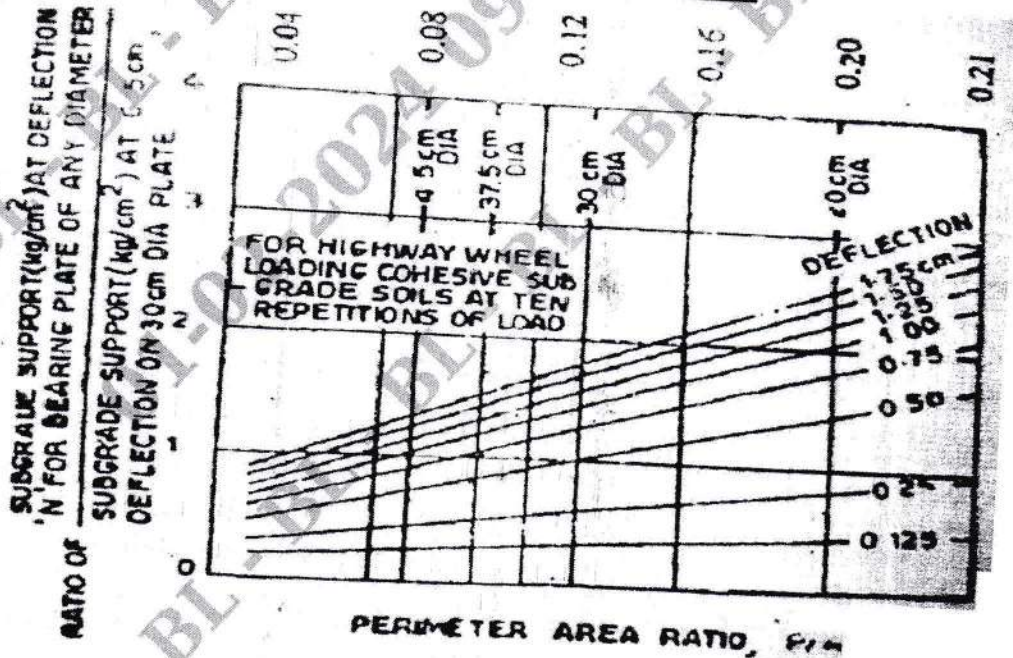
- 3 a. Compute the ESWL of a dual wheel assembly carrying 20.5kN each for pavement thickness of 150mm, 200mm and 250mm. Center to center tyre spacing is 270mm, clear distance between the walls of dual tyre 110mm. (06 Marks)
- b. Explain the concept of Equivalent Single Wheel Load [ESWL]. (06 Marks)
- c. Design a highway for a wheel load of 4100kg with a tyre pressure of 5kg/cm² by McLeod method. The plate bearing test carried out on subgrade soil use 30cm dia plate yielded by a pressure of 2.5kg/cm². After 10 repetition of load at 0.5cm deflection. (08 Marks)



Relation between Plate Diameter and Base Course Constant

Relation between Plate Diameter and Base Course Constant
Fig.Q3(c)(i)

McLeod Method Problems



Relationship of Subgrade Support with P/A

Fig.Q3(c)(ii)

OR

- 4 a. Calculate the design repetition for 20-year period for various wheel load equivalent 22.68kN wheel load using the following traffic survey data on two lane road.

Wheel load, kN	22.68	27.22	31.75	36.29	40.82	45.36
Vol. of each wheel load per day	28	33	25	30	13	13

(10 Marks)

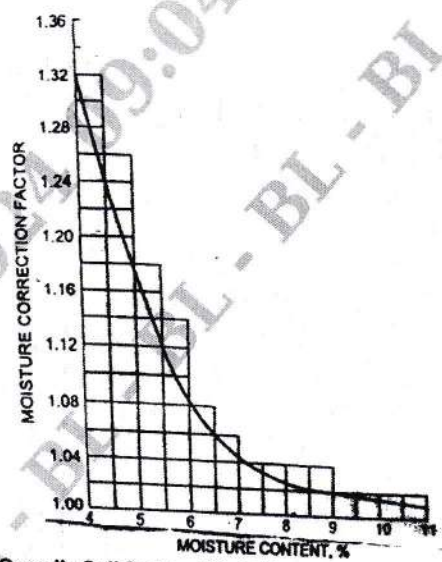
- b. Design the pavement section by Triaxial test method using the following data :

- i) Wheel load = 41kN
- ii) Tyre pressure = 0.75N/mm²
- iii) Traffic co-efficient, X = 1.5
- iv) Saturation co-efficient, Y = 0.6
- v) Design Deflection, Δ = 2.5mm
- vi) E – value of subgrade, E_s = 10N/mm²
- vii) E – value of base course, E_b = 25N/mm²
- viii) E – value of 60mm thick bituminous course, E_{bc} = 100N/mm².

(10 Marks)

Module-3

- 5 a. List the general causes of flexible pavement failures and analyse the failure with respect to subbase and base course. (06 Marks)
- b. Explain briefly the various maintenance works of bituminous surfaces. (06 Marks)
- c. Benkelman beam deflection studies were carried out on a highway pavement with 50mm thick bituminous surface course, when the mean pavement surface temperature was 40°C and the field moisture content of subgrade soil was 5.5(%) percent. The soil is found to be sandy and the annual rainfall of the region is 950mm. The characteristic deflection value, D_c if the selected sub-stretch is found to be 1.32mm. Determine the corrected deflection value after applying the corrections for temperature and seasonal variation in subgrade moisture. (08 Marks)



(a) Sandy / Gravelly Soil for Low Rainfall Areas (Annual rainfall < 1300 mm)

Fig.Q5(c)

OR

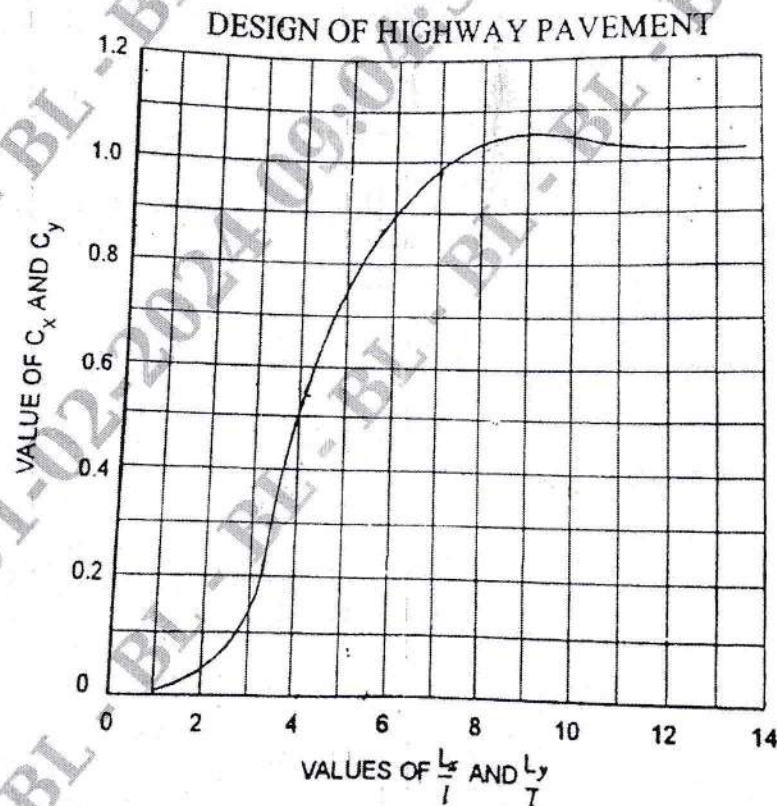
- 6 Write a note on :
- a. Falling weight deflectometer. (06 Marks)
 - b. Benkelman beam deflection method. (06 Marks)
 - c. Functional evaluation by visual inspection and unevenness measurement. (08 Marks)

Module-4

- 7 a. Explain:
- Temperature stresses
 - Frictional stresses
 - Critical stresses. (06 Marks)
- b. Write the Westergaards stress equation for wheel load stresses and write the assumptions. (06 Marks)
- c. Calculate the wheel load stress at critical section by IRC stress equation using the following data :
- | | | |
|----------------------------------|-------------------------|------------|
| Design wheel load, (P) | = 51kN | |
| Tyre pressure (P) | = 0.72N/mm ² | |
| E-value of concrete | = 30kN/mm ² | |
| Modulus of subgrade reaction (K) | = 0.1N/mm ² | |
| Slab thickness = (h) | = 250mm | |
| Poisson's ratio, μ | = 0.15. | (08 Marks) |

OR

- 8 a. Explain :
- Radius of relative stiffness
 - Equivalent radius of resisting section
 - Modulus of subgrade reaction. (10 Marks)
- b. Determine the warping stress in a 25cm concrete pavement with 12m transverse joint width of lane is 3.6m and temperature differential between top and bottom of concrete slab is 15°C. For concrete $E = 3.2 \times 10^5 \text{ kg/cm}^2$, $\mu = 0.15$ and $K = 5 \text{ kg/cm}^3$ use stress chart. (10 Marks)



Warping stress coefficient chart (by Bradbury)

Fig.Q8(b)
5 of 6

Module-5

- 9 a. Explain the rigid pavement failures and its causes. (10 Marks)
b. Explain different methods of pavement functional evaluation. (10 Marks)

OR

- 10 a. Explain the neat sketches, the various types of joints in C.C. pavements and its function. (10 Marks)
b. Explain the various types of remedial measures in C.C. pavements and their uses. (10 Marks)
