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

INDEX FILE QUESTION PAPERS JUN/JUL 2023

MECHANICAL

MECHANICAL DEPARTMENT

2018
III Sem. M.E

USN ☐☐☐☐☐☐☐☐☐☐ 18MATDIP31

Third Semester B.E. Degree Examination, June/July 2023
Additional Mathematics - I

Time: 3 hrs.   Max. Marks: 100

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

Module-1

1   a. Express the complex number $\dfrac{(3+i)(1-3i)}{2+i}$ in the form x + iy. Also find its magnitude.

         (06 Marks)

   b. Find the cube roots of $\ell - i$ and represent them in an argand plane. **(07 Marks)**

   c. If $\vec{a} = 2\hat{i} + 3\hat{j} - 4\hat{k}$ and $\vec{b} = 8\hat{i} - 4\hat{j} + \hat{k}$ then show that $\vec{a}$ is perpendicular to $\vec{b}$, also find $|\vec{a} \times \vec{b}|$.

         (07 Marks)

OR

2   a. Find the modulus and amplitude of $1 - \cos\alpha + i\sin\alpha$. **(06 Marks)**

   b. If $\vec{a} = \hat{i} + \hat{j} - \hat{k}$; $\vec{b} = 2\hat{i} - \hat{j} + 2\hat{k}$ and $\vec{c} = 3\hat{i} - \hat{j} - \hat{k}$, find

     i) $\vec{a} \cdot (\vec{b} \times \vec{c})$ ii) $\vec{b} \times (\vec{a} \times \vec{c})$. **(07 Marks)**

   c. Prove that $[\vec{a} \times \vec{b}, \vec{b} \times \vec{c}, \vec{c} \times \vec{a}] = [\vec{a}\ \vec{b}\ \vec{c}]^2$. **(07 Marks)**

Module-2

3   a. Using Maclaurin's series, prove that $\sqrt{1+\sin 2x} = 1 + x - \dfrac{x^2}{2} - \dfrac{x^3}{6} + \dfrac{x^4}{24} - - - -$. **(06 Marks)**

   b. If $u = \tan^{-1}\left(\dfrac{x^3 + y^3}{x - y}\right)$, prove that $x\dfrac{\partial u}{\partial x} + y\dfrac{\partial u}{\partial y} = \sin 2u$. **(07 Marks)**

   c. If $u = 1 - x$, $v = x(1-y)$, $w = xy(1-z)$, find $\dfrac{\partial(u,v,w)}{\partial(x,y,z)}$. **(07 Marks)**

OR

4   a. Obtain the Maclaurin's expansion of the function $\log(1 + e^x)$. **(06 Marks)**

   b. If $u = f(x-y, y-z, z-x)$, Prove that $\dfrac{\partial u}{\partial x} + \dfrac{\partial u}{\partial y} + \dfrac{\partial u}{\partial z} = 0$. **(07 Marks)**

   c. If $u = x + y + z$, $w = y + z$, $z = uvw$, find $\dfrac{\partial(x,y,z)}{\partial(u,v,w)}$. **(07 Marks)**

Module-3

5   a. A particle moves along a curve C with parametric equations $x = t - \dfrac{t^3}{3}$, $y = t^2$ and $z = t + \dfrac{t^3}{3}$, where t is the time. Find the velocity and acceleration and any time t and also find their magnitudes at t = 3.

         (06 Marks)

   b. Find div $\vec{F}$ and Curl $\vec{F}$, where $\vec{F} = \nabla(x^3 + y^3 + z^3 - 3xyz)$. **(07 Marks)**

   c. Find the directional derivative of $\phi = x^2 yz^3$ at (1, 1, 1) in the direction of $\hat{i} + \hat{j} + 2\hat{k}$.

         (07 Marks)

3

OR

6 a. Show that the vector field $\vec{F} = yz\,\hat{i} + xz\,\hat{j} + xy\,\hat{k}$ is solenoidal vector field. **(06 Marks)**

   b. If $\vec{F} = (x + y + 1)\,\hat{i} + \hat{j} - (x + y)\,\hat{k}$, show that $\vec{F} \cdot \text{curl } \vec{F} = 0$. **(07 Marks)**

   c. Find the constants a, b, c such that $\vec{F} = (x + y + az)\,\hat{i} + (x + cy + 2z)\,\hat{k} + (bx + 2y - z)\,\hat{j}$ is irrotational. **(07 Marks)**

Module-4

7 a. Obtain the Reduction formula for $\int_{0}^{\pi/2} \cos^n x \, dx$. **(06 Marks)**

   b. Evaluate $\int_{0}^{1}\int_{x}^{\sqrt{x}} (x^2 + y^2)\, dy\, dx$. **(07 Marks)**

   c. Evaluate $\int_{0}^{1}\int_{0}^{1}\int_{0}^{1} (x + y + z)\, dx\, dy\, dz$. **(07 Marks)**

OR

8 a. Evaluate $\int_{1}^{2}\int_{0}^{3-y} xy \, dx \, dy$. **(06 Marks)**

   b. Evaluate $\int_{0}^{1}\int_{0}^{1}\int_{0}^{1} e^{x+y+z}\, dx\, dy\, dz$. **(07 Marks)**

   c. Obtain the Reduction formula $\int \sin^m x \cos^n x \, dx$. **(07 Marks)**

Module-5

9 a. Solve : $(x^2 + y)\, dx + (y^3 + x)\, dy = 0$. **(06 Marks)**

   b. Solve : $x \log x \dfrac{dy}{dx} + y = 2 \log x$. **(07 Marks)**

   c. Solve : $\dfrac{dy}{dx} + \dfrac{y}{x} = y^2 x$. **(07 Marks)**

OR

10 a. Solve : $y\, e^y\, dx = (y^3 + 2x\, e^y)\, dy$. **(06 Marks)**

   b. Solve : $(x^2 - y^2)\, dx = 2xy\, dy$. **(07 Marks)**

   c. Solve : $[1 + (x + y) \tan y] \dfrac{dy}{dx} + 1 = 0$. **(07 Marks)**

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4

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18ME32

Third Semester B.E. Degree Examination, June/July 2023
Mechanics 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. Explain with neat sketch, stress-strain diagram of mild steel indicating it's salient points.
    (06 Marks)

    b. Define : (i) Hooke's law   (ii) Modulus of rigidity   (iii) Volumetric strain
       (iv) Poisson's ratio
    (04 Marks)

    c. A steel bar ABCD of varying sections is subjected to axial forces as shown in Fig. Q1 (c). Find the value of 'P' necessary for equilibrium. If $E = 210 \, kN/mm^2$, determine
       (i)   Stress in various segments
       (ii)   Total elongation of bar
       (iii) Total strain in the bar.
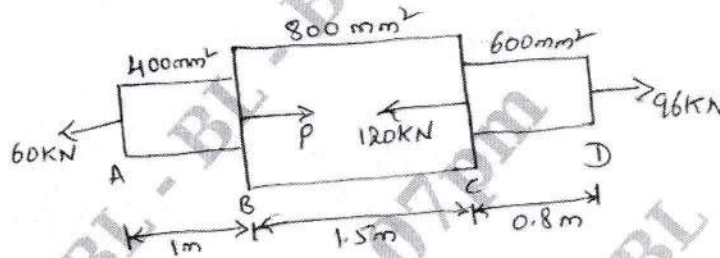
Fig. Q1 (c)   **(10 Marks)**

OR

2   a. Derive a relation between young's modulus (E) and modulus of rigidity (G).   **(10 Marks)**

    b. A composite bar shown in Fig. Q2 (b) is 0.2 mm short a distance between the rigid supports at room temperature. What is maximum temperature rise which will not produce stress in the bar? Find stresses induced when temperature rise is $40°C$. Given $\alpha_s = 12 \times 10^{-6}$ per $°C$, $\alpha_c = 17.5 \times 10^{-6}$ per $°C$, $E_s = 2 \times 10^5 \, N/mm^2$, $E_C = 1.2 \times 10^5 \, N/mm^2$, $A_S : A_C = 4 : 3$
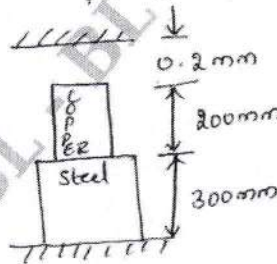
Fig. Q2 (b)   **(10 Marks)**

Module-2

3   a. Derive an expression for normal stress, shear stress and resultant stress on an oblique plane inclined at an angle 'θ'. With vertical axis (x-plane) in a bi-axial stress system subjected to σ_1 and σ_2 also find angle of obliquity ϕ.
    (10 Marks)

5

b. A point in a strained material, the stress on two planes at right angles to each other are 80 N/mm²(tensile) and 40 N/mm² (tensile). Each of above stresses is accompanied by a shear stress of 60 N/mm². Determine (i) Normal stress, shear stress and resultant stress on an oblique plane inclined at an angle of 45° to the axis of minor tensile stress. Also find major principal stress , minor principal stress and their location, maximum shear stress and its location.
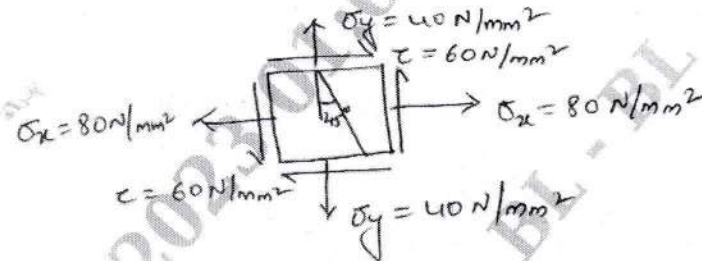
Fig.Q3 (b)   (10 Marks)

OR

4 a. Derive expression for hoop stress and longitudinal stress for thin cylinder subjected to internal fluid pressure.   (10 Marks)

   b. A thick cylindrical pipe of outside diameter 300 mm and internal diameter 200 mm is subjected to an internal fluid pressure of 20 N/mm² and external fluid pressure of 5 N/mm². Determine the maximum hoop stress developed. Draw the variation of hoop stress and radial stress across the thickness indicating the values at every 25 mm interval.   (10 Marks)

Module-3

5 a. Deduce the relationship between relating load (W), Shear Force (F) and Bending moment (M).   (06 Marks)

   b. For the beam shown in Fig. Q5 (b), draw SFD and BMD. Locate the point of contraflexure, if any.
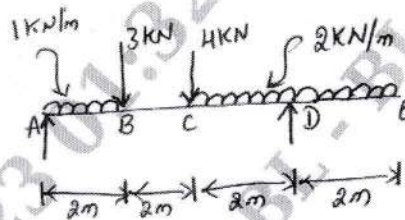
Fig. Q5 (b)   (14 Marks)

OR

6 a. Prove that in case of a rectangular section of a beam the maximum shear stress is 1.5 times the average shear stress.   (08 Marks)

   b. A beam of an I-section consists of 180mm × 15mm flanges and a web of 280 mm depth × 15 mm thickness.
   It is subjected to a bending moment of 120 kN-m and a shear force of 60 kN. Sketch the bending and shear stress distributions along the depth of the section.

Fig. Q6 (b)   (12 Marks)

6
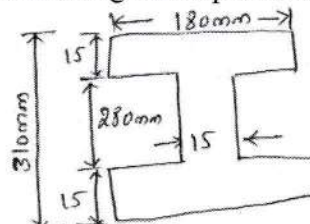
Module-4

7 a. Write a note on the following :
   - (i) The maximum principal stress theory.
   - (ii) The maximum shear stress theory. **(08 Marks)**

   b. A solid circular shaft is subjected to a bending moment of 9000 Nm and a twisted moment of 12000 Nm. In a simple uniaxial tensile test of the same material, it gives the following particulars. Stress at yield point 300 N/mm². Assume factor of safety = 3. Estimate the least diameter required using, (i) Maximum principal stress theory
   (ii) Maximum shear stress theory. **(12 Marks)**

OR

8 a. Derive the torsion equation with usual notation $\dfrac{T}{J} = \dfrac{G\theta}{L} = \dfrac{\tau}{R}$. State the assumption made in the derivation. **(10 Marks)**

   b. A solid circular shaft has to transmit a power of 1000 kW at 120 rpm. Find the diameter of the shaft, if the shear stress of the material must not exceed 80 N/mm². The maximum torque 1.25 times of its mean. What percentage of saving in material would be obtained, if the shaft is replaced by a hollow one whose internal diameter is 0.6 times its external diameter, the length, material and maximum shear stress being same? **(10 Marks)**

Module-5

9 a. State the assumption made while deriving Euler's column formula. Also derive Euler's expression of buckling load, for column with both ends fixed. **(10 Marks)**

   b. A 1.5 m long columns has a circular cross section of 50 mm diameter. One of the ends of the column is fixed in direction and position and other end is free. Taking factor of safety as 3. Calculate the safe load using :

   (i) Rankine's formula, take yield stress $\sigma_c = 560$ N/mm² and $\alpha = \dfrac{1}{1600}$ for pinned ends.

   (ii) Euler's formula, young's modulus for CI = 1.2×10^5 N/mm² **(10 Marks)**

OR

10 a. Explain the following :
   - (i) Castigliano's Ist and IInd theorem.
   - (ii) Strain energy due to bending and torsion
   - (iii) Strain energy due to shear. **(15 Marks)**

   b. The bar with circular cross section as shown in Fig. Q10 (b) is subjected to a load of 10 kN. Determine the strain energy stored in it. Take $E = 2.1 \times 10^5$ N/mm².

Fig. Q10 (b) **(05 Marks)**

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CBCS SCHEME

USN | | | | | | | | | | **18ME33**

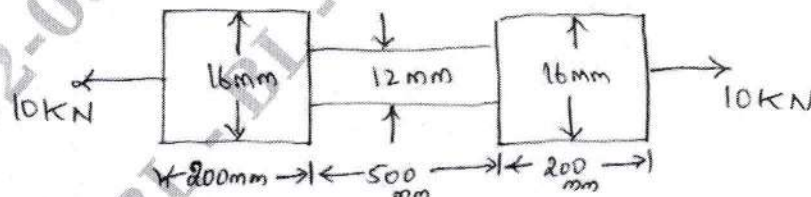### Third Semester B.E. Degree Examination, June/July 2023
Basic Thermodynamics

Time: 3 hrs.   Max. Marks: 100

Note: 1. *Answer any FIVE full questions, choosing ONE full question from each module.*
2. *Use of Thermodynamics handbook is permitted.*

Module-1

1   a.   Define the following :
         i) Closed system   ii) Open system   iii) Isolated system   iv) Thermodynamics state
                                                                  (08 Marks)
    b.   State the Zeroth law of Thermodynamic and briefly explain its significance.   **(04 Marks)**
    c.   The reading t_A and t_B of two Celsius thermometers A and B agree at the ice point (0°C) and
         the steam point (100°C) and are related by the equations $t_A = \ell + mt_B + t_B^2$. Between these
         two point ℓ, m, n are constants. When both are immersed in an oil bath. A indicates 55°C and
         B indicates 50°C. Determine the value of ℓ, m, n and also find the reading on A if B reads
         25°C.
                                                                  (08 Marks)

OR

2   a.   Mention the characteristics of thermodynamic properties.   **(04 Marks)**
    b.   Classify the differences between microscopic and macroscopic approaches.   **(06 Marks)**
    c.   The temperature t on a certain Celsius thermometer scale is given by means of a property
         through a relations $t = a \ln (P) + b$ where a and b are constant P is the property of the fluid.
         If, at the ice point and steam points the values of P are found to be 4 and 20 respectively.
         What will be temperature reading corresponding to a reading of P = 16?   **(10 Marks)**

Module-2

3   a.   List the difference between work and heat.   **(06 Marks)**
    b.   Explain the path function and point functions.   **(06 Marks)**
    c.   A stationary mass of a gas is compressed in a friction less way from 1 bar and $0.1m^3$ to 5 bar
         and $0.03m^3$. Assuming that the pressure and volume are related by Pr^n = constant, find the
         workdone on the gas.   **(08 Marks)**

OR

4   a.   Show that energy is a property of system.   **(06 Marks)**
    b.   Derive the steady flow energy equations [SFEE] for a single stream of fluid entering and a
         single stream of fluid leaving the control volume.   **(06 Marks)**
    c.   Air flows steadily through a rotary compressor. At entry the air is 20°C and 101KPa at exit
         the some air is at 200°C and 600KPa. Assuming the flow to be adabatic i) Evaluate the work
         done per unit mass of air if the velocities at inlet and exit are negligible ii) What would be
         the increase in work input if the velocities at inlet and exit are 50m/s and 110m/s.   **(08 Marks)**

Module-3

5   a.   State the limitation of first law of thermodynamics illustrate with example.   **(04 Marks)**
    b.   State the Kelvin – Planks and Claudius statement of the second law of thermodynamics and
         prove their equivalence.   **(08 Marks)**

c. A reversible heat engine operates between two reservoirs at temperature of 600ºC and 40ºC the engine drives a reversible refrigerator, which operates between 40ºC and 20ºC. The heat transfer to the engine is 2000kJ and network output from combined engine and refrigerator system is 360kJ. Calculate heat transfer and net heat transfer to the reservoir at 40ºC.

(08 Marks)

OR

6 a. State and prove Clasius inequality. (06 Marks)
b. Show that entropy is a property. (06 Marks)
c. $1.2m^3$ of air is heated reversibly at constant pressure from 300K and 600K and is then cooled reversibly at constant volume back to initial temperature. If the initial pressure is 1 bar, calculate net heat flow and overall change in entropy. Also represent the processes on T-S diagram. Take $C_p = 1.005$kJ/Kg K and $R = 0.287$kJ/Kg K. (08 Marks)

Module-4

7 a. Explain briefly available and unavailable energies referred to a cyclic process. (04 Marks)
b. Derive an expression for available energy from a finite energy source at temperature T_1 when the surrounding temperature is T_0. (08 Marks)
c. A Carnot engine works between the temperature limits of 225ºC and 25ºC in which water issued as the working fluid, if heat is supplied to the saturated liquid water at 225ºC until it is converted into saturated Vapoun, determine per Kg of water.
   i) The amount of heat absorbed by the fluid
   ii) The available energy
   iii) The unavailable energy. (08 Marks)

OR

8 a. Draw a neat sketch of throttling calorimeter and explain how dryness fraction of steam is determined. Clearly explain its limitations. (10 Marks)
b. Define the following :
i) Triple point   ii) Critical temperature   iii) Dryness fraction   iv) Saturation temperature
v) Pure substances. (10 Marks)

Module-5

9 a. State and explain Amagat's law and Dalton's law of partial pressures. (06 Marks)
b. A tank of $0.1m^3$ capacity contains 1Kg of O_2, 0.9Kg of N_2, 1.5Kg CO_2, and 0.1 Kg of CO at 30ºC. Determine :
i) The total pressure   ii) Mole fractions of each gas   iii) Gas constant "R" and Molecular weight M of the mixture. (06 Marks)
c. A gas mixture consists of 0.5Kg of Carbon monoxide and 1Kg of CO_2. Determine :
i) Mass fractions   ii) Mole fraction of each component   iii) The Avg. Molecular weight
iv) the Gas constant of the mixture. (08 Marks)

OR

10 i) Compressibility factor
ii) Law of corresponding
iii) Compressibility chart
iv) Vender Waals equations of state
v) Beattie Bridge Man- equations. (20 Marks)
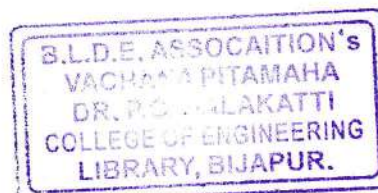
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18ME34

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Third Semester B.E. Degree Examination, June/July 2023
Material Science

Time: 3 hrs.   Max. Marks: 100

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

Module-1

1   a.   Draw the neat sketch of BCC and FCC structure and also find the APF of both the structure.
                                                                                (10 Marks)
    b.   Explain points defects and Edge dislocation with necessary diagrams.   (10 Marks)

OR

2   a.   Explain linear and non-linear behavior of elastic properties of materials.   (10 Marks)
    b.   Explain slip and twinning.   (05 Marks)
    c.   Explain mechanisms of strengthening in metals.   (05 Marks)

Module-2

3   a.   Draw the S – N diagram for fatigue failure also explain mechanism of fatigue failure.
                                                                                (10 Marks)
    b.   Draw the creep curve and explain the different stages of creep curve.   (10 Marks)

OR

4   a.   Explain the rule of Hume – Rothery to form the substitutional solid solution.   (10 Marks)
    b.   Draw the Iron carbon diagram and mark all the phases on it also explain ferrite and austenite structure.   (10 Marks)

Module-3

5   a.   Draw the T – T – T diagram and superimpose CCT diagram on it. Explain these two diagrams importance.   (10 Marks)
    b.   Explain Annealing, normalizing and tempering process.   (10 Marks)

OR

6   a.   Explain austempering and martempering processes with neat diagrams.   (10 Marks)
    b.   Explain carburizing, cyaniding and nitriding processes   (10 Marks)

Module-4

7   a.   Classify the composite based on matrix and reinforcement. Explain brief about the matrix and reinforcement.   (10 Marks)
    b.   Any two methods of production of PMCs.   (10 Marks)

OR

8   a.   Any two methods of production CMCs.   (10 Marks)
    b.   State the advantage and applications of composites.   (10 Marks)

Module-5

9   a.   Explain any two processing of plastics.   (10 Marks)
    b.   Write note on thermal and optical material - IS   (10 Marks)

OR

10 a.   Explain shape memory alloys and fiber optic materials.   (10 Marks)
    b.   Explain any two ceramics processing methods.   (10 Marks)

10

CBCS SCHEME

18ME35B/MEB305

USN

Third Semester B.E. Degree Examination, June/July 2023
Metal Casting and Welding

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 factors to be considered in the selection of a process for production.　(07 Marks)
　　b.　Explain : i) Shrinkage allowance　ii) Machining allowance　(05 Marks)
　　c.　List the different types of patterns. Explain any two types of pattern with neat sketches.
　　　　(08 Marks)

OR

2　a.　With a neat sketch, explain the working of Jolt moulding machine.　(06 Marks)
　　b.　With a neat sketch, explain the process, application and limitation of shell moulding process.
　　　　(08 Marks)
　　c.　With neat sketch, explain i) Open Riser　ii) Blind Riser　(06 Marks)

Module-2

3　a.　With a neat sketch, explain resistance-furnace.　(06 Marks)
　　b.　Draw a neat sketch of cupola furnace showing various zones and explain the chemical reactions involved.　(08 Marks)
　　c.　With a neat sketch, explain centrifugal casting process.　(06 Marks)

OR

4　a.　Explain the process of gravity die casting with neat sketch,　(06 Marks)
　　b.　Explain with neat sketch indirect arc electric furnace.　(06 Marks)
　　c.　With a neat sketch, explain slush casting process. List the advantages and disadvantages.
　　　　(08 Marks)

Module-3

5　a.　Define solidification. Explain the variables in the metal solidification process.　(06 Marks)
　　b.　List the sources of gases in liquid metals. Explain vacuum degassing process.　(08 Marks)
　　c.　With a neat sketch, explain stream droplet degassing method.　(06 Marks)

OR

6　a.　Explain any five casting defects with neat sketch, also suggest remedies for defects.
　　　　(10 Marks)
　　b.　What is meant by fettling? Briefly explain the various steps involved in fettling.　(06 Marks)
　　c.　List the advantages and limitations of aluminium castings.　(04 Marks)

Module-4

7　a.　With a neat sketch, explain Flux Shielded Metal Arc Welding (FSMAW) process. State its advantages and limitations.　(10 Marks)
　　b.　With a neat sketch, explain explosive welding process. State its advantages and limitations.
　　　　(10 Marks)

OR

8 a. With a neat sketch, explain atomic hydrogen welding process. List its advantages and limitations. **(10 Marks)**

   b. With a neat sketch, explain electron beam welding process. List the advantages and disadvantages. **(10 Marks)**

Module-5

9 a. What is Heat Affected Zone (HAZ)? Explain the parameters affecting HAZ. **(07 Marks)**

   b. Differentiate brazing and soldering. **(06 Marks)**

   c. With neat sketch, explain X-ray radiography inspection process. **(07 Marks)**

OR

10 a. What are the functions of flux in welding process. **(04 Marks)**

   b. Explain Oxy-acetylene gas welding process with neat sketch. State its advantages and disadvantages. **(08 Marks)**

   c. With a neat sketch, explain ultrasonic inspection method. State its advantages and disadvantages. **(08 Marks)**

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12

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18AU36

Third Semester B.E. Degree Examination, June/July 2023
Manufacturing Process – I

Time: 3 hrs.　　　　　　　　　　　　　　　　　　　　Max. Marks: 100

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

Module-1

1　a. Explain different types of pattern used in casting process, with neat sketch. **(10 Marks)**
　　b. What are the steps involved in casting process? Explain them briefly. **(10 Marks)**

OR

2　a. Explain any five types of casting defects, with neat sketch. **(10 Marks)**
　　b. Write the principles of Gate's and Risers, with neat sketch. **(10 Marks)**

Module-2

3　a. Discuss about the Jolt and Squeeze type moulding machine and write the advantages of both. **(10 Marks)**
　　b. Sketch and explain the sweep moulding process and list out the advantages. **(10 Marks)**

OR

4　a. Explain the construction and working principles of Hot Chamber die casting process. **(10 Marks)**
　　b. With a sketch, explain the principle of operation of Coke Fired Pit Furnace and also list the advantages. **(10 Marks)**

Module-3

5　a. List out the applications of welding process. **(08 Marks)**
　　b. With neat sketch, explain the Metal Arc Welding (MAW) process and also write the advantages and disadvantages. **(12 Marks)**

OR

6　a. List out the advantages and disadvantages of Gas Welding Process. **(08 Marks)**
　　b. Explain the construction and working Gas torch. **(08 Marks)**
　　c. Write about Forward and Backward welding process. **(04 Marks)**

Module-4

7　a. With neat sketch and explain working principle about spot welding. **(10 Marks)**
　　b. List out the advantages of projection welding. **(05 Marks)**
　　c. Write the application of resistance welding. **(05 Marks)**

OR

8　a. With a neat sketch, explain the laser beam welding process. **(10 Marks)**
　　b. Mention the advantages and limitations of electron beam welding process. **(06 Marks)**
　　c. List the application of explosive welding process. **(04 Marks)**

13

Module-5

9 a. What are the parameters which affect soldering? (06 Marks)
b. Differentiate Soldering and Brazing. (08 Marks)
c. List out the advantages and disadvantages of brazing. (06 Marks)

OR

10 a. Explain ultrasonic inspection of (NDT) with neat sketch. (10 Marks)
b. What is NDT? Listout the methods and explain magnetic particle inspection. (10 Marks)

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14

CBCS SCHEME

18ME36B/18MEB306

USN ☐☐☐☐☐☐☐☐☐☐

Third Semester B.E. Degree Examination, June/July 2023
Mechanical Measurements and Metrology

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 objectives of metrology? **(05 Marks)**
  b. Explain with neat schematic diagram:
     (i)   Imperial standard yard
     (ii) International prototype meter **(10 Marks)**
  c. Differentiate line standard and end standard. **(05 Marks)**

OR

2 a. Explain working principle of sine bar with a neat sketch. **(06 Marks)**
  b. Build up length of 35.4875 mm using M112 set. Use two protractor slip of 2.5 mm each. **(06 Marks)**
  c. With a neat sketch, explain the working principle of an autocollimator. **(08 Marks)**

Module-2

3 a. Explain with neat schematic diagram:
     (i) Hole basis system   (ii) Shaft basis system **(10 Marks)**
  b. Determine the tolerances on the hole and the shaft for a precision running fit designated by 50H7g6, by considering following data:
     50 mm lies between 30-50 mm
     i (in microns) $= 0.45 (D)^{\frac{1}{3}} + 0.001D$
     Fundamental deviation for 'H; hole = 0
     Fundamental deviation for g shaft $= -2.5 D^{0.34}$
     IT7 $= 16i$ and   IT6 $= 10i$
     State the actual maximum and minimum sizes of the hole and shaft maximum and minimum clearance. **(10 Marks)**

OR

4 a. Explain the working principle of Linear Variable Deferential Transformer (LVDT). **(10 Marks)**
  b. Sketch and explain the working of Solex pneumatic comparator. **(10 Marks)**

Module-3

5 a. Derive an expression for measuring effective diameter of the thread using 2-wire method. **(10 Marks)**
  b. Sketch and explain Tool Maker's Microscope. **(10 Marks)**

OR

6 a. Derive an expression for gear tooth thickness using constant chord method. **(08 Marks)**
  b. Explain the following with neat sketches: (i) Measurement of pitch (ii) Concentricity **(12 Marks)**

15

Module-4

7 a. Define the following terms with reference to measurement with sketch;
       (i)   Linearity
       (ii) Sensitivity
       (iii) Hysteresis
   b. Explain with the help of block diagram, generalized measurement system. (06 Marks)
   c. What is error? Explain different types of errors. (08 Marks)
   (06 Marks)

OR

8 a. Explain the Ballast circuit with the help of schematic diagram. (08 Marks)
   b. What are the advantages of electrical transducers? (04 Marks)
   c. Explain the working principle of CRO with a block diagram. (08 Marks)

Module-5

9 a. Explain the following with a neat sketch:
       (i)   Pirani gauge
       (ii) McLeod gauge
   b. Explain with a neat sketch, the wooden block prony brake dynamometer. (12 Marks)
   (08 Marks)

OR

10 a. State and explain laws of thermocouple. (10 Marks)
   b. Explain with the help of neat diagram, the working principle of optical pyrometer. (10 Marks)

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16

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18MAT31

Third Semester B.E. Degree Examination, June/July 2023
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 $L\left(\dfrac{\cos at - \cos bt}{t}\right)$. **(06 Marks)**

b. Express the function in terms of unit step function and hence find Laplace transform of
$$f(t) = \begin{cases} \sin t & 0 < t < \frac{\pi}{2} \\ \cos t & \frac{\pi}{2} < t < \pi \end{cases}$$ **(07 Marks)**

c. Solve $y''(t) + 4y'(t) + 3y(t) = e^t$, $y(0) = y'(0) = 1$ by using Laplace transform method. **(07 Marks)**

OR

2 a. Find : (i) $L^{-1}\left(\log\left(\dfrac{s+b}{s+a}\right)\right)$ (ii) $L^{-1}\left(\dfrac{s+3}{s^2 - 4s + 13}\right)$ **(06 Marks)**

b. Find $L^{-1}\left(\dfrac{s}{(s^2 + a^2)^2}\right)$ by using convolution theorem. **(07 Marks)**

c. Given $f(t) = \begin{cases} t & 0 < t < a \\ 2a - t & a < t < 2a \end{cases}$

where $f(t) = f(t + 2a)$ then show that $L(f(t)) = \dfrac{1}{s^2}\tan h\left(\dfrac{as}{2}\right)$ **(07 Marks)**

Module-2

3 a. Obtain Fourier series for $f(x) = \dfrac{\pi - x}{2}$, $0 < x < 2\pi$. **(06 Marks)**

b. Find Fourier series for $f(x) = 2x - x^2$, $0 < x < 2$. **(07 Marks)**

c. Find half range Fourier cosine series for
$$f(x) = \begin{cases} x, & 0 < x < \frac{\pi}{2} \\ \pi - x, & \frac{\pi}{2} < x < \pi \end{cases}$$ **(07 Marks)**

OR

4 a. Find Fourier series for $f(x) = |x|$, $-\pi < x < \pi$. **(06 Marks)**

b. Obtain Fourier series for $f(x) = \begin{cases} 0 & -2 < x < 0 \\ 1 & 0 < x < 2 \end{cases}$. **(07 Marks)**

c. Find the Fourier series upto first harmonic from the following table:

x	0	1	2	3	4	5
y = f(x)	4	8	15	7	6	2

(07 Marks)

1 of 3

17

Module-3

5 a. Find Fourier transform of f(x), given:

$$f(x) = \begin{cases} 1, & |x| \le 1 \\ 0, & |x| > 1 \end{cases}$$ and hence deduce that $\int_0^\infty \frac{\sin x}{x} dx = \frac{\pi}{2}$. **(06 Marks)**

b. Find the Fourier cosine transform of

$$f(x) = \begin{cases} 4x & 0 < x < 1 \\ 4-x & 1 < x < 4 \\ 0 & x > 4 \end{cases}$$ **(07 Marks)**

c. Solve $u_{n+2} + 4u_{n+1} + 3u_n = 3^n$, given $u_0 = 0$, $u_1 = 1$ using Z - transform. **(07 Marks)**

OR

6 a. Find the Fourier sine transform of $e^{-|x|}$ and hence evaluate $\int_0^\infty \frac{x \sin mx}{1+x^2} dx$. **(06 Marks)**

b. Find Z-transform of $\cos n\theta$ and $a^n \cos n\theta$. **(07 Marks)**

c. Obtain the inverse Z-transform of $\dfrac{2z^2 + 3z}{(z+2)(z-4)}$. **(07 Marks)**

Module-4

7 a. Find the value of y at x = 0.1 and x = 0.2 given $\dfrac{dy}{dx} = x^2 y - 1$, $y(0) = 1$ by using Taylor's series method. **(06 Marks)**

b. Compute y(0.1), given $\dfrac{dy}{dx} = \dfrac{y-x}{y+x}$, $y(0) = 1$ taking h = 0.1, by using Runge-Kutta 4th order method. **(07 Marks)**

c. Find the value of y at x = 0.4, given $\dfrac{dy}{dx} = 2e^x - y$ with initial conditions y(0) = 2, y(0.1) = 2.010, y(0.2) = 2.04, y(0.3) = 2.09 by using Milne's predictor and corrector method. **(07 Marks)**

OR

8 a. Using modified Euler's method, find the value of y at x = 0.1, given $\dfrac{dy}{dx} = -xy^2$, y(0) = 2 taking h = 0.1. **(06 Marks)**

b. Solve $\dfrac{dy}{dx} = 3e^x + 2y$, y(0) = 0 at x = 0.1 taking h = 0.1, by using Runge-Kutta 4th order method. **(07 Marks)**

c. Find the value y at x = 0.8 given $\dfrac{dy}{dx} = x - y^2$ and

x	0	0.2	0.4	0.6
y	0	0.0200	0.0795	0.1762

By using Adam's Bashforth predictor and corrector method. **(07 Marks)**

18

Module-5

9 a. Solve $\dfrac{d^2y}{dx^2} = x\left(\dfrac{dy}{dx}\right)^2 - y^2$ for x = 0.2 given x = 0, y = 1 and $\dfrac{dy}{dx} = 0$ by using Runge-Kutta method. **(07 Marks)**

   b. Derive Euler's equation in the standard form $\dfrac{\partial f}{\partial y} = \dfrac{d}{dx}\left(\dfrac{\partial f}{\partial y'}\right) = 0$. **(06 Marks)**

   c. Find the extremal of the function $\displaystyle\int_0^1 [(y')^2 + 12xy]dx$ with y(0) = 0 and y(1) = 1. **(07 Marks)**

OR

10 a. Find the value of y at x = 0.8, given $\dfrac{d^2y}{dx^2} = 2y\dfrac{dy}{dx}$ and

x	0	0.2	0.4	0.6
y	1	0.2027	0.4228	0.6841
y'	1	1.041	1.179	1.468

   by using Milne's method. **(07 Marks)**

   b. Prove that the shortest between two points in a plane is a straight line. **(06 Marks)**

   c. Find the curve on which the functional $\displaystyle\int_0^1 [x + y + (y')^2]dx$ with y(0) = 1, y(1) = 2. **(07 Marks)**

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19

CBCS SCHEME

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Question Paper Version : D

Third/Fourth Semester B.E./B.Tech. Degree Examination, June/July 2023
CONSTITUTION OF INDIA AND PROFESSIONAL ETHICS

[Time: 1 hrs.]   [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.

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1. The tenure of the Council of state is,
   a) Not subject to dissolution   b) 2 years   c) 5 years   d) 4 years

2. When elections are held in one or a few constituencies due to death or resignation of candidates, it is called as _____.
   a) General election   b) Primary election
   c) By election   d) Midterm election

3. Fundamental Rights are borrowed from the constitution of,
   a) UK   b) USA   c) Germany   d) Ireland

4. What is the minimum age to become Judges of Supreme Court of India?
   a) 25 years   b) 30 years   c) 35 years   d) None of these

5. The Indian constitution gives the power of amending the constitution to,
   a) The people of India   b) The president
   c) The Parliament   d) Supreme Court of India

6. Right to Education (RTE) was introduced in _____ Amendment,
   a) 86th b) 42nd c) 44th d) 61st

7. How many types of writs can be issued by the Supreme Court for the protection of Fundamental Rights?
   a) Four   b) Five   c) One   d) Six

8. Who presides over the sessions of Rajya Sabha?
   a) Speaker   b) Home minister   c) Vice-president   d) President

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VACHANA PITAMAHA
DR. P.G. HALAKATTI

20

9. Who appoints the Vice-Chancellors of the state universities?
a) Education minister b) District commissioner c) Chief minister   d) Governor

10. Election commission is a _____ body and the term of election commission is _____ years or _____ years of age whichever is earliear.
a) Uni-member, 4 years or 62 years   b) Multi-member, 6 years or 65 years
c) Constitutional body, 5 years or 60 years d) None of these

11. Which of the following is not the concept of responsibilities?
a) Minimalist   b) Reasonable care   c) Utilitarianism   d) Good works

12. Lying means,
a) Intentionally conveying false information to others   b) Fabrication
c) Plagarism   d) All of these

13. The three types of Justice reffered in our preamble are :
a) Social, Economic and Religious   b) Social, Economic and Natural
c) Social, Economic and International   d) Social, Economic and Political

14. An arrested person must be produced before a magistrate within _____ hours of arrest.
a) 12   b) 24   c) 36   d) 48

15. Election commission conducts the election as per which act?
a) Parliament act   b) People's representative act of 1982
c) Code of conduct act   d) State representative act

16. When the office of the president, falls vacant, the same must be filled up with in?
a) 3 months   b) 6 months   c) 1 year   d) 9 months

17. Who among the following are not entitled to form Union or Association,
a) Police   b) Teachers   c) Workers   d) Doctors

18. The MLA's of various state legislative assemblies are varying between,
a) 40 to 450   b) 50 - 500   c) 28 - 12   d) 60 - 500

19. A bill cannot become an act of parliament, unless and until _____?
a) it is passed by Lok Sabha   b) it is passed by Rajya Sabha
c) it gets assent from President   d) it gets approved by Supreme Court

20. Who hoisted the National Flag during 74th Republic day function in New Delhi?
a) Prime Minister   b) President
c) Vice-President   d) Chief justice of India

21. The member to be nominated by the President for the council of states are from,
a) Literature   b) Science   c) Sports   d) All of these

22. Which of the following Pairs is not property matched ,
a) 44th Amendment-citizenship act   b) 52nd Amendment-Anti Defection Law
c) 42nd Amendment-Fundamental duties   d) 73rd Amendment-Local self Government

23. The speaker of Lok Sabha,
a) is appointed by the President   b) is nominated by the Vice-President
c) is choosen by the members of Lok Sabha d) is elected by the members of parliament

24. Financial Emergence has been imposed in India,
    a) Once   b) Never   c) Twice   d) Thrice

25. Respect for the National Flag and the National Anthem is,
    a) a Fundamental right   b) a Fundamental Duty
    c) a Directive principle   d) an ordinary duty

26. A non-member of the state legislature can be the minister for a period not exceeding,
    a) Six month   b) One year   c) Six weeks   d) Three months

27. Engineering ethics is a,
    a) developing ethics   b) Preventive ethics
    c) natural ethics   d) Scientifically developed ethics

28. Risk estimation can be done by using,
    a) Cooking   b) Trimming   c) Event tree   d) Both (a) and (b)

29. The Patent holder does not allow others to use patented information for _____ years from the date of filing.
    a) 25   b) 30   c) 50   d) 20

30. The use of intellectual property of others without their permission or credit is referred to as,
    a) Cooking   b) Plagiarism   c) Patents   d) Formulae

31. How many members were nominated to the parliament by the president of India?
    a) 14 members   b) 12 members   c) 2 members   d) 6 members

32. Who among the following distribute portfolious for the council of minister,
    a) President   b) Vice president   c) Prime Minister   d) Speaker of Lok Sabha

33. The chief justice and other judges of the supreme court hold office till they complete,
    a) Sixty years   b) Sixty five years   c) Sixty two years   d) Seventy years

34. The council of ministers are responsible to the,
    a) Rajya Sabha   b) Vidhan Parshid   c) Lok Sabha   d) Supreme court

35. The Vice-President of India is elected by the,
    a) Judges of the supreme court   b) President
    c) Prime Minister   d) Members of parliament

36. Who can issue ordinance when the parliament is not in session:
    a) President   b) High court judges   c) Home minister   d) Finance minister

37. In case of the violation of the Fundamental Rights we may approach the,
    a) Civil Courts   b) Supreme Court   c) High Court   d) Both (a) and (b)

38. Which of the following equalities is/are included in the Right to Equality?
    a) Equality before law   b) Equal protection of law
    c) Equal opportunities in the public employment   d) All of these.

39. Prohibition of trafficking in human beings and forced labour comes under which of the following fundamental right?
    a) Right to freedom   b) Right against exploitation
    c) Cultural & Educational Right   d) Right to equality.

40. There is no provision in the constitution for the impeachment of the,
    a) President   b) Vice President   c) Governor   d) Supreme court Judges

41. When was the Indian constitution enacted and adopted?
    a) 26/10/1949   b) 26/11/1949   c) 26/4/1949   d) 26/01/1950

42. 'We the people of India' are the opening words of the,
    a) Preamble of the Indian constitution   b) Article 21 of the Indian constitution
    c) Fundamental rights   d) Directive principles of state policy

43. Which one of these is the primary source of the Indian constitution?
    d) British constitution   b) Irish constitution
    c) Charter Act of 1833   d) Government of India Act of 1935

44. The original Indian constitution had :
    a) 12 parts, 6 schedule and 320 Articles   b) 20 parts, 8 schedule and 380 Articles
    c) 12 parts, 8 schedule and 396 Articles   d) 12 parts, 10 schedule and 300 Articles

45. The word 'Sovereign' means that,
    a) Supreme in nature   b) A country is under dictatorship
    c) A country is poor of weak   d) A country is strong and powerfull

46. Directive principles are,
    a) Justiciable   b) Not practiced at rural levels
    c) Non-justiciable   d) Associated to the Government worker's

47. How much time was taken for training the constitution?
    a) 1 year, 11 months, 18 days   b) 5 year, 11 months, 18 days
    c) 2 year, 11 months, 18 days   d) 3 year, 11 months, 18 days

48. India is a Sovereign, socialist, selular, democratic and republic in the Indian constitution this expression occurs in,
    a) Citizenship   b) Preamble
    c) Fundamental rights   d) Directive principles

49. Who among the following is the supreme commander of the Armed forces?
    a) Air Chief Marshal   b) Prime Minister
    c) Defense Minister   d) President

50. The 91st Amendment Act (2003) is associated with,
    a) Size of the council of ministers   b) Primary education
    c) Fundamental Duty   d) Powers of the President

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23

CBCS SCHEME

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21MAT31

Third Semester B.E. Degree Examination, June/July 2023
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
$$2^t + \frac{\cos 2t + \cos 3t}{t}$$
   (06 Marks)

   b. Find the Laplace transform of the triangular wave of period 2C given by
$$f(t) = \begin{cases} t & 0 < t < c \\ 2c - t & c < t < 2c \end{cases}$$
   (07 Marks)

   c. Using convolution theorem find the inverse Laplace transform of
$$\frac{s}{(s^2 + a^2)^2}$$
   (07 Marks)

OR

2. a. Express the function f(t) in terms of unit step function and hence find the Laplace transform
   of $\quad f(t) = \begin{cases} \sin t & 0 < t < \pi \\ \sin 2t & \pi < t < 2\pi \\ \sin 3t & t \geq 2\pi \end{cases}$
   (06 Marks)

   b. Find the inverse laplace transform $\dfrac{2s^2 - 6s + 5}{(s-1)(s-2)(s-3)}$
   (07 Marks)

   c. Solve the using Laplace transform method
   $$y''(t) + 4y'(t) + 4y = e^{-t} \qquad y(0) = 0 \qquad y'(0) = 0$$
   (07 Marks)

Module-2

3. a. Obtain the Fourier series of $f(x) = \dfrac{\pi - x}{2}$ in $0 < x < 2\pi$. Hence deduce that
$$1 - \frac{1}{3} + \frac{1}{5} - \frac{1}{7} + \dots = \frac{\pi}{4}$$
   (06 Marks)

   b. Obtain the half range cosine series for the function $f(x) = 2x - 1$ in $0 < x < 1$ **(07 Marks)**

   c. Obtain the Fourier series of y upto the first harmonic for the following values:

x°	45	90	135	180	225	270	315	360
y	4.0	3.8	2.4	2.0	-1.5	0	2.6	3.4

   (07 Marks)

24

OR

4 a. Obtain the Fourier series of $f(x) = x\cos x$ in the interval $-\pi \le x \le \pi$. **(06 Marks)**

   b. Obtain the sine half range Fourier series for the function,

   $$f(x) = \begin{cases} \dfrac{2Kx}{\ell} & \text{in } 0 \le x \le \dfrac{\ell}{2} \\[2mm] \dfrac{2K}{\ell}(\ell - x) & \text{in } \dfrac{\ell}{2} \le x \le \ell \end{cases}.$$ **(07 Marks)**

   c. Obtain the constant term and the first three coefficients in the Fourier cosine series of y in the following data :

x	0	1	2	3	4	5
y	4	8	15	7	6	2

   (07 Marks)

Module-3

5 a. Find the complex Fourier transform of the function,

   $$f(x) = \begin{cases} a^2 - x^2 & \text{for } |x| < a \\ 0 & \text{for } |x| > a \end{cases}.$$

   Hence evaluate $\displaystyle\int_0^\infty \left(\frac{\sin s - s\cos s}{s^3}\right)ds = \frac{\pi}{2}$. **(06 Marks)**

   b. Find the Fourier sine transform of e^{-ax}. **(07 Marks)**

   c. Find the z-transform of $\cos n\theta$ and $\sin n\theta$. **(07 Marks)**

OR

6 a. Find the Fourier cosine transform of the function, $f(x) = \begin{cases} 4x & 0 < x < 1 \\ 4-x & 1 < x < 4 \\ 0 & x > 4 \end{cases}$. **(06 Marks)**

   b. Find the inverse z-transform of $\dfrac{2z^2 + 3z}{(z+2)(z-4)}$. **(07 Marks)**

   c. Solve by using z-transform $y_{n+2} - 4y_n = 0$ given that $y_0 = 0$ and $y_1 = 2$. **(07 Marks)**

Module-4

7 a. Classify the following partial differential equation

   i) $\dfrac{\partial^2 u}{\partial x^2} + 4\dfrac{\partial^2 u}{\partial x \partial y} + 4\dfrac{\partial^2 u}{\partial y^2} - \dfrac{\partial y}{\partial x} + 2\dfrac{\partial u}{\partial y} = 0$

   ii) $x^2\dfrac{\partial^2 u}{\partial x^2} + (1 - y^2)\dfrac{\partial^2 u}{\partial y^2} = 0 \quad -\infty < x < \infty, \ -1 < y < 1$

   iii) $(1 + x^2)\dfrac{\partial^2 u}{\partial x^2} + (5 + 2x^2)\dfrac{\partial^2 u}{\partial x \partial t} + (4 + x^2)\dfrac{\partial^2 u}{\partial t^2} = 0$

   iv) $(x + 1)\dfrac{\partial^2 u}{\partial x^2} - 2(x + 2)\dfrac{\partial^2 u}{\partial x \partial y} + (x + 3)\dfrac{\partial^2 u}{\partial y^2} = 0$

   (10 Marks)

b. Find the values of u(x, t) satisfying the parabolic equation $\frac{\partial^2 u}{\partial x^2} = 2\frac{\partial u}{\partial t}$ and its boundary conditions u(0, t) = 0 = u (4,t) and u(x, 0) = x(4 – x) by taking h = 1 find the value up to t = 5. **(10 Marks)**

OR

8 a. Solve $\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2}$ in 0 < x < 5, t ≥ 0 given that u(x, 0) = 20 u(0, t) = 0 u(5,t) = 100 compute U for the time step h = 1 by crank Nicholson method. **(10 Marks)**

b. Solve the wave equation $\frac{\partial^2 u}{\partial t^2} = 4\frac{\partial^2 u}{\partial x^2}$ subject to the condition u(0, t) = 0 u(4, t) = 0 u$_t$(x, 0) = 0 and u(x, 0) = x(4 – x) by taking h = 1, K = 0.5 up to four steps. **(10 Marks)**

Module-5

9 a. Given $\frac{d^2 y}{dx^2} - x^2\frac{dy}{dx} - 2xy = 1$, y(0)) = 1, y'(0) = 0 evaluate y(0.1) using Runge-Kutta method of order 4. **(06 Marks)**

b. Derive the Euler's equation of the form $\frac{\partial t}{\partial y} - \frac{d}{dx}\left(\frac{\partial t}{\partial y1}\right) = 0$. **(07 Marks)**

c. Find the extremal of the functional $I = \int_0^{\pi/2}(y^2 - y'^2 - 2y\sin x)dx$ under the conditions y(0) = y(π/2) = 0. **(07 Marks)**

OR

10 a. Apply Milne's predictor corrector method to solve $\frac{d^2 y}{d^2 x} = 1 - 2y\frac{dy}{dx}$ at 0.8 given that

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. **(06 Marks)**

b. Show that the geodesics on a plane are straight line. **(07 Marks)**

c. Which curve the functional $\int_0^{\pi/2}(y'^2 - y^2 + 2xy)dx$, y(0) = 0, y(π/2) = 0 be extremized.

(07 Marks)

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CBCS SCHEME
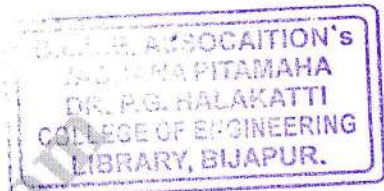
USN ⬜⬜⬜⬜⬜⬜⬜⬜⬜⬜   **21ME32**

Third Semester B.E. Degree Examination, June/July 2023
Metal Casting, Forming and Joining Processes

Time: 3 hrs.   Max. Marks: 100

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

Module-1

1 a. List the different types of pattern. Explain match plate pattern with a neat sketch. **(07 Marks)**
   b. Briefly discuss the importance of binders and additives in sand moulding. **(07 Marks)**
   c. With a neat sketch explain Jolt type of Molding machine. **(06 Marks)**

OR

2 a. With a neat sketch explain shell moulding process. **(10 Marks)**
   b. What is core? Explain the need of core. **(04 Marks)**
   c. Draw a neat sketch of gating system showing all the elements. **(06 Marks)**

Module-2

3 a. With a neat sketch explain the different zones present in CUPOLA furnace. **(12 Marks)**
   b. With a neat sketch explain Direct electric arc furnace. **(08 Marks)**

OR

4 a. What is die casting? With a neat sketch explain gravity die casting process. **(10 Marks)**
   b. With a neat sketch explain continuous casting process. **(10 Marks)**

Module-3

5 a. Differentiate between hot working and cold working process. **(04 Marks)**
   b. With a sketch explain Gravity (or) board drop hammer. **(06 Marks)**
   c. Explain with a sketches any four type of rolling mills. **(10 Marks)**

OR

6 a. With respect to sheet metal forming explain :
     (i) Blanking process
     (ii) Bending process. **(04 Marks)**
   b. With a sketches explain progressive die and compound die. **(08 Marks)**
   c. With a sketch explain explosive high energy rate forming process. **(08 Marks)**

Module-4

7 a. With a neat sketch explain Gas Welding process. Also explain types of flames used in gas welding. **(12 Marks)**
   b. With a neat sketch explain manual metal arc welding. **(08 Marks)**

OR

8 a. With a sketch explain Gas tungsten arc welding process. **(10 Marks)**
   b. With a sketch explain Submerged arc welding. **(10 Marks)**

27

Module-5

9 a. Define Weldability. With respect to the thermal aspects explain the following :
       (i) Distortion   (i) Shrinkage   (iii) Residual stresses.   (12 Marks)
   b. Briefly explain welding defects and their remedies.   (08 Marks)

OR

10 a. Explain the following Joining Processes.
       i) Soldering
       ii) Brazing
       iii) Adhesive bonding   (12 Marks)
   b. Explain with a sketch Resistance arc welding process. Also mention their advantages and limitations.   (08 Marks)

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21ME33

Third Semester B.E. Degree Examination, June/July 2023
Material Science 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. Classify Engineering Materials. Explain them with examples. **(08 Marks)**
　b. Differentiate between crystalline and non-crystalline solids. **(07 Marks)**
　c. Explain the various geometrical crystal rotation geometry operations. **(05 Marks)**

OR

2　a. Define unit cell and crystal lattice. Explain the cubic, tetragonal, orthorhombic and rhobhohedral unit cells with examples. **(10 Marks)**
　b. Define atomic packing factor. Calculate APF of FCC unit cell. **(05 Marks)**
　c. Define crystal imperfections in solids. Explain point imperfections. **(05 Marks)**

Module-2

3　a. Classify and explain solid solutions. What are intermediate phases? **(10 Marks)**
　b. Explain Hume – Rothery rules. **(04 Marks)**
　c. Explain (i) Gibb's phase rule　(ii) Level rule. **(06 Marks)**

OR

4　a. Explain the eutectic system binary phase diagram for two metals completely soluble in liquid state but completely insoluble in solid state. **(10 Marks)**
　b. Explain the two Fick's laws of diffusion. **(04 Marks)**
　c. Explain the role of imperfections in diffusions. **(06 Marks)**

Module-3

5　a. Explain the homogeneous and heterogeneous nucleation process with a suitable sketch or graph or equations. **(10 Marks)**
　b. Explain the plastic deformation by :
　　(i) Slip　　　　　(ii) Twinning. **(06 Marks)**
　c. Define and classify strengthening mechanisms. Explain anyone method. **(04 Marks)**

OR

6　a. Differentiate between Annealing and Normalising. **(05 Marks)**
　b. With sketch, explain the flame hardening process. **(05 Marks)**
　c. Explain the TTT diagram for 0.8% C eutectoid steel. **(10 Marks)**

Module-4

7　a. Classify surface coating methods. Explain the electrochemical coating method. **(08 Marks)**
　b. Explain the various surface coating materials. **(06 Marks)**
　c. What are the advantages and disadvantages of powder metallurgy? **(06 Marks)**

29

OR

8 a. Explain the characteristics of metal powders with regard to particle size and shape distribution. (06 Marks)
   b. Explain : (i) Powder compacting process   (ii) Powder sintering process. (08 Marks)
   c. What are the applications of powder metallurgy? (06 Marks)

Module-5

9 a. Explain the evolution of engineering materials. (06 Marks)
   b. Explain the design process with a suitable flow chart. (08 Marks)
   c. With sketch, explain the design tools and materials data. (06 Marks)

OR

10 a. Classify engineering materials. Explain them with examples. (10 Marks)
   b. Classify material property charts. Sketch and explain the Young's modulus – density chart. (10 Marks)

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21ME34

Third Semester B.E. Degree Examination, June/July 2023
Thermodynamics

Time: 3 hrs.   Max. Marks: 100

Note: 1. *Answer any FIVE full questions, choosing ONE full question from each module.*
2. *Use of Thermodynamic Data Hand book is permitted.*

Module-1

1 a. Explain different types of temperature scales. **(04 Marks)**
   b. Derive an expression for PdV work for an isentropic process. **(08 Marks)**
   A thermo couple with test junction at $1°C$ on a gas thermo meter scale and reference junction at ice point gives the emf as $e = (0.3t - 4 \times 10^{-4q}t)mV$. The millimeter is calibrated at ice and steam points. What will be the reading on this thermometer when gas thermometer reads $80°C$? **(08 Marks)**

OR

2 a. Obtain the expression for displacement work,
   (i) Isothermal process
   (ii) Polytropic process.
   (iii) Isobaric process
   (iv) Isochronic process. **(10 Marks)**
   b. A piston-cylinder arrangement contains a fluid system which passes through a complete cycle of four process. During a cycle, the sum of all heat transfer is $-170kJ$. The system completes 100 cycles per minute. Complete the following table and compute the net rate of work in K.

Process	Q KJ/min	W KJ/min	ΔE KJ/min
AB	0	2170	-
BC	21000	0	-
CD	2100	-	36600
DA	-	-	-

(10 Marks)

Module-2

3 a. Give Kelvin Plank and Clausius statements of second law of thermodynamics. **(04 Marks)**
   b. Show that entropy is a property of system. **(06 Marks)**
   c. A heat engine working on a Carnot cycle absorbs heat from three thermal reservoirs at 1000 K, 800 K and 600 K respectively. The engine does 10 kW of net work and rejects 400 kJ/min of heat to the sink at 300 K if the heat supplies by the reservoir at 1000 K is 60% of heat supplied by the reservoir at 600 K. Find the quantities of heat supplies by each reservoirs. **(10 Marks)**

OR

4 a. State and prove Clausius inequality. (08 Marks)
   b. State and Carnot's theorem. (02 Marks)
   c. Heat is transferred by conduction from a reservoir at 500°K to a reservoir at 300°K at the rate of 100 kJ/min. Evaluate $\oint \dfrac{\delta Q}{T}$. What will be $\oint \dfrac{\delta Q}{T}$ if reversible heat engine operates between these two reservoirs? How much work would be have been done by the engine. (10 Marks)

Module-3

5 a. Write Maxwell equations and explain the terms involved. (06 Marks)
   b. Define : (i) Sub cooled liquid (ii) Tripple point (iii) Critical point. (06 Marks)
   c. Super heated steam from initial condition of 5 bar and 300°C is expanded isentropically to a pressure of 0.5 bar. Calculate (i) Final condition of steam after expansion (ii) Change in enthalpy / kg of steam (iii) Change in internal energy / kg of steam. (08 Marks)

OR

6 a. With a neat sketch, explain working of a combined separating and throttling calorimeter. (10 Marks)
   b. Steam at 10 bar and dry state is cooled under constant pressure until it becomes 0.85 dry. Using steam tables find the work done, change in enthalpy, heat transfer and change in entropy. (10 Marks)

Module-4

7 a. Define :
      (i) Mole fraction.
      (ii) Mass fraction.
      (iii) Dalton's law.
      (iv) Amagat's law of additives (10 Marks)
   b. A mixture of gases contain 1 kg of CO_2 and 1.5 kg of N. The pressures and temperature of the mixture are 3.5 bar and 27°C. Calculate
      (i) Mole fraction of each constituent.
      (ii) Partial pressure.
      (iii) Partial value.
      (iv) Volume of mixture.
      (v) Density of mixture (10 Marks)

OR

8 a. Derive an expression of air standard efficiency of diesel cycle with neat PV and TS diagrams. (10 Marks)
   b. An engine with 200 mm cylinder and 300 mm stoke length works on diesel cycle. The initial pressure and temperature of air are 0.1 MPa and 27°C. The cut off is 8% of stoke volume and compression ratio is 15. Calculate
      (i) Pressure and temperature of salient points.
      (ii) Air standard efficiency. (10 Marks)

Module-5

9 a. Draw a neat PV and TS diagram of air standard dual cycle and derive an expression for air standard efficiency interms of compression ratio, explosion ratio and cut off ratio under what conditions the dual cycle becomes otto cycle and diesel cycle. **(10 Marks)**

b. An air standard diesel cycle has compression ratio 16. The temperature before compressor is $27°C$ and the temperature after expansion is $627°C$. Compute
   (i)   Cut off ratio.
   (ii)   The net work output per unit mass of air.
   (iii) Thermal efficiency.
   (iv)   Mean effective pressure in bar.   **(10 Marks)**

OR

10 a. Explain any two methods of improving the efficiency of an open cycle gas turbine plant. **(10 Marks)**

b. In an open cycle gas turbine plant air enters the compressor at 1 bar and $27°C$. The pressure of after compression is 4 bar. The isentropic efficiency of the turbine and compressor are 85%, 80% and air fuel ratio is 80%. The calorific value of fuel used is 42000 kJ/kg and mass flow rate is 2.5 kg/s. Calculate the power output from the plant and the cycle efficiency. Assume that C_P and γ to be same for both air and products of combustion. **(10 Marks)**

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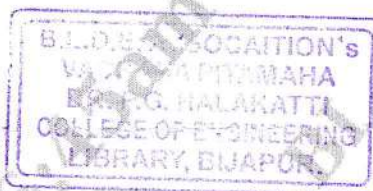
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Fourth Semester B.E. Degree Examination, June/July 2023
Additional Mathematics – II

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 rank of the matrix by applying elementary row operations :

$$A = \begin{bmatrix} 0 & 2 & 3 & 4 \\ 2 & 3 & 8 & 4 \\ 4 & 8 & 13 & 12 \end{bmatrix}$$

                                                     (06 Marks)

  b.   Test for consistency and solve the system :

$$x + y + z = 6$$
$$x - y + 2z = 5$$
$$3x + y + z = 8.$$

                                                     (07 Marks)

  c.   Find the eigen value and the corresponding eigen vectors of the matrix :

$$A = \begin{bmatrix} -2 & 2 & -3 \\ 2 & 1 & -6 \\ -1 & -2 & 0 \end{bmatrix}.$$

                                                     (07 Marks)

OR

2   a.   Reduce the matrix A to the echelon firm, where

$$A = \begin{bmatrix} 2 & -1 & -3 & -1 \\ 1 & 2 & 3 & -1 \\ 1 & 0 & 1 & 1 \\ 0 & 1 & 1 & -1 \end{bmatrix}.$$

                                                     (06 Marks)

  b.   Find the values of λ and μ such that the system

$$x + y + z = 6$$
$$x + 2y + 3z = 10$$
$$x + 2y + \lambda z = \mu$$

     may have
     i)   unique solution
     ii)   infinite solution
     iii)   no solution.

                                                     (07 Marks)

  c.   Solve :

$$2x + y + 4z = 12$$
$$4x + 11y - z = 33$$
$$8x - 3y + 2z = 20$$

     By Gauss elimination method

Module-2

3 a. The area of a circle (A) corresponding to diameter (D) is given in the following table :

D	80	85	90	95	100
A	5026	5674	6362	7088	7854

Find the area when D = 105 using an appropriate interpolation formula. **(06 Marks)**

b. Find the real root of the equation $\cos x = 3x - 1$ correct to three decimal places using Regula – Falsi method. **(07 Marks)**

c. Evaluate $\int_0^1 \frac{x\,dx}{1+x^2}$ using Weddle's rule. Take seven ordinates. **(07 Marks)**

OR

4 a. Find $u_{0.5}$ from the data $u_0 = 225$, $u_1 = 238$, $u_2 = 320$, $u_3 = 340$ by using an appropriate interpolation formula. **(06 Marks)**

b. Use Newton – Raphson method to find a real root of the equation $x^3 + 5x - 11 = 0$ correct to the three decimal places. **(07 Marks)**

c. Using Simpson's $1/3^{rd}$ rule, evaluate $\int_0^1 \frac{dx}{1+x^2}$ by dividing the interval [0, 1] into six equal parts. Hence deduce the value of $\log_e^2$. **(07 Marks)**

Module-3

5 a. Solve $(D^3 - 6D^2 + 11D - 6)\,y = 0$. **(06 Marks)**

b. Solve $(D^2 - 4)y = \cos h\,(2x - 1) + 3^x$. **(07 Marks)**

c. Solve $\frac{d^2y}{dx^2} + 3\frac{dy}{dx} + 2y = 4\cos^2 x$. **(07 Marks)**

OR

6 a. Solve $\frac{d^3y}{dx^3} + y = 0$. **(06 Marks)**

b. Solve $y'' + 9y = \cos 2x \cdot \cos x$ **(07 Marks)**

c. Solve $y'' - (a + b)y' + aby = e^{ax} + e^{bx}$. **(07 Marks)**

Module-4

7 a. Form a partial differential equation by eliminating the arbitrary constants in $ax^2 + by^2 + z^2 = 1$. **(06 Marks)**

b. Form the partial differential equation by eliminating the arbitrary function from $\ell x + my + nz = \phi(x^2 + y^2 + z^2)$. **(07 Marks)**

c. Solve $\frac{\partial^2 z}{\partial x^2} = a^2 z$, given that when $x = 0$, $z = 0$ and $\frac{\partial z}{\partial x} = a \sin y$. **(07 Marks)**

35

OR

8 a. Form a partial differential equation by eliminating the arbitrary constructs from :

$z = xy + y\sqrt{x^2 - a^2} + b$.

(06 Marks)

   b. Solve $\dfrac{\partial^2 z}{\partial x^2} = x + y$ by direct integration.

(07 Marks)

   c. Solve $\dfrac{\partial^2 z}{\partial y^2} = z$, given that $z = 0$, $\dfrac{\partial z}{\partial y} = \sin x$, when $y = 0$.

(07 Marks)

Module-5

9 a. Define :
   i)   Sample space
   ii) Mutually exclusive events
   iii) Mutually independent events.

(06 Marks)

   b. A box contains 4 black, 5 white and 6 red balls. If 2 balls are drown at random, what is the probability that :
   i)   both are red
   ii) one black and one white.

(07 Marks)

   c. State and prove Baye's theorem.

(07 Marks)

OR

10 a. If A and B are events with $P(A \cup B) = \dfrac{7}{8}$, $P(A \cap B) = \dfrac{1}{4}$ and $P(A \cap \bar{B}) = \dfrac{1}{3}$.
    Find :
    i) $P(A)$
    ii) $P(B)$
    iii) $P(\bar{A} \cap B)$.

(06 Marks)

    b. A problem is given to four students A, B, C, D whose chances of solving it are $\dfrac{1}{2}, \dfrac{1}{3}, \dfrac{1}{4}, \dfrac{1}{5}$ respectively. Find the probability that the problem is solved.

(07 Marks)

    c. Three machines A, B and C produce 50%, 30% and 20% of the items in a factory. The percentage of defective outputs of these machines are 3, 4, and 5 respectively. If an item is selected at random, what is the probability that it is defective? If a selected item is defective, what is the probability that it is from machine A?

(07 Marks)

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CBCS SCHEME

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18ME42

Fourth Semester B.E. Degree Examination, June/July 2023
Applied Thermodynamics

Time: 3 hrs.   Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. Use of thermodynamic data hand book is permitted.

Module-1

1   a.   Define the following terms :
     (i)   Compression ratio.
     (ii)   Cut off ratio.
     (iii)   Thermal efficiency.
     (iv)   Relative efficiency.   (04 Marks)
    b.   Derive an expression for air standard efficiency of a diesel cycle.   (08 Marks)
    c.   Calculate the loss in the ideal efficiency of a diesel engine with compression ratio 14 if the cut off ratio is delayed from 5% to 8%.   (08 Marks)

OR

2   a.   What do you mean by detonation? Name the factors affecting detonation. (04 Marks)
    b.   With a $P-\theta$ diagram describe the stages of combustion in CI engine.   (08 Marks)
    c.   During a 60 minutes trial on a single cylinder oil engine having cylinder dia 300 mm, stroke 450 mm and working on two stroke cycle. The following observations were made :
    Total fuel used = 9.6 ltr, Heating value of fuel = 45000 kJ/kg,
    Total number of revolution = 12624, Gross mep = 7.24 bar,
    Pumping mep = 0.34 bar, Net brake load = 3150 N
    Brake drum dia = 1.78 m, Rope dia = 40 mm
    Cooling water circulated = 545 ltr
    Cooling water temperature rise = 25 °C
    Specific gravity of oil = 0.8
    Determine : IP, BP, mechanical efficiency and Draw the Heat balance sheet.   (08 Marks)

Module-2

3   a.   Explain Brayton cycle with line diagram, P-V diagram and derive an expression for pressure ratio for maximum work.   (10 Marks)
    b.   A gas turbine unit has a pressure ratio of 6 : 1 and maximum cycle temperature of 610 °C. The Isentropic efficiencies of compressor and Turbine are 0.8 and 0.82 respectively. Calculate the power output in kW of an electric generator geared to the turbine when the air enters the compressor at 15 °C at the rate of 16 kg/sec.
    Take $C_P = 1.005$ kJ/kg, $\gamma = 1.4$ for air.
         $C_P = 1.11$ kJ/kg, $\gamma = 1.333$ for gas.   (10 Marks)

OR

4   a.   Explain the methods for the improvement of thermal efficiency of a open cycle gas turbine.   (10 Marks)
    b.   Explain the following jet propulsion system :
     (i)   Ramjet Engine   (ii)   Rocket Engine.   (10 Marks)

Module-3

5 a. Why Carnot cycle is practically not possible? (04 Marks)
  b. State the advantages of regenerative cycle over Rankine cycle. (04 Marks)
  c. Explain with sketch, the parameters affecting the Rankine cycle. (12 Marks)

OR

6 a. Explain with sketch, T-S and S-H diagram, the regenerative Rankine cycle. (10 Marks)
  b. A simple Rankine Cycle works between pressure 30 bar and 0.04 bar, the initial condition of steam being dry saturated. Calculate the cycle efficiency, work ratio and specific steam consumption. (10 Marks)

Module-4

7 a. For a reversed Brayton cycle show that $COP = \dfrac{1}{r_p^{\gamma-1}} - 1$. (10 Marks)

  b. With neat diagram, explain steam jet refrigeration. (10 Marks)

OR

8 a. Define the following terms :
  (i) Dry bulb temperature
  (ii) Dew point temperature
  (iii) Specific humidity
  (iv) Relative humidity
  (v) Degree of saturation (10 Marks)
  b. The atmospheric conditions are $20\,^\circ C$ and specific humidity of 0.0095 kJ/kg of dry air. Calculate :
  (i) Partial pressure of water vapour
  (ii) Relative humidity (10 Marks)

Module-5

9 a. Derive an expression for isothermal efficiency of a single stage air compressor. (10 Marks)
  b. An air compressor takes in air at 1 bar and $30\,^\circ C$ compresses it according to the law $PV^{1.2} = C$. Air is delivered to a receiver at a constant pressure of 10 bar, determine temperature at the end of compression, WD and Heat transferred during compression/kg air. Neglect clearance. Take R = 0.287 kJ/kgK. (10 Marks)

OR

10 a. Define steam Nozzle and Name the types of nozzle. (04 Marks)
   b. With a neat sketch, describe the working of a steam injector. (06 Marks)
   c. Steam approaches a nozzle with a velocity of 250 m/s, 3.5 bar and dryness fraction 0.95. If the back pressure is 2 bar, assuming flow to be isentropic, find the final condition of steam and drop in Enthalpy. Also find the exit velocity and the area at exit of steam nozzle if the flow rate is 2700 kg/h. (10 Marks)

CBCS SCHEME

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18ME43

Fourth Semester B.E. Degree Examination, June/July 2023
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 the following properties of fluids and write their SI units:
      (i) Specific weight   (ii) Kinematic viscosity   (iii) Specific volume   **(06 Marks)**
    b. Define surface tension of a fluid. Derive an expression for surface tension of a :
      (i) liquid droplet   (ii) Liquid jet   **(06 Marks)**
    c. The dynamic viscosity of an oil used for lubrication between a shaft and sleeve is 6 poise. The shaft is of diameter 0.4 m. It rotates at 190 rpm. Calculate the power lost in the bearing for a sleeve length of 90 mm. The thickness of the oil film is 1.5 mm.   **(08 Marks)**

OR

2   a. State and prove Pascal's law.   **(06 Marks)**
    b. Derive an expression for total pressure and depth of centre of pressure for a vertical surface submerged in water.   **(06 Marks)**
    c. Determine the total pressure and centre of pressure on an isosceles triangular plate of base 4 m and altitude 4m when it is immersed vertically in an oil of specific gravity 0.9. The base of the plate coincides with the free surface of oil.   **(08 Marks)**

Module-2

3   a. Define:
      (i) Buoyancy   (ii) Centre of Buoyancy
      (iii) Meta centre   (iv) Meta centric height   **(08 Marks)**
    b. Explain the method to find the metacentric height experimentally.   **(06 Marks)**
    c. A block of wood of specific gravity 0.7 floats in water. Determine the metacentric height of the block if its size is 2m × 1m × 0.8m.   **(06 Marks)**

OR

4   a. Differentiate between:
      (i)   Steady and unsteady flow
      (ii) Laminar and turbulent flow
      (iii) Compressible and incompressible flow   **(06 Marks)**
    b. Derive the continuity equation in three dimensional Cartesian coordinates for a steady, incompressible fluid flow.   **(08 Marks)**
    c. The diameter of a pipe at sections 1 and 2 are 10 cm and 15 cm respectively. Find the discharge through the pipe if the velocity of water at section 1 is 5 m/s. Determine also the velocity at section 2.   **(06 Marks)**

Module-3

5   a. Derive Euler's equation of motion along a stream line. Deduce Bernoulli's equation from Euler's equation. State the assumptions made.   **(10 Marks)**
    b. A pipe line carrying oil of specific gravity 0.87 changes in diameter from 200 mm at a position A to 500 mm at a position B which is 4 m at higher level. If the pressure at A and B are 10 N/cm^2 and 6 N/cm^2 respectively and the discharge is 200 litres/s. determine the loss of head and the direction of fluid flow.   **(10 Marks)**

39

OR

6   a.   Derive Hagen-Posseuille's equation for laminar flow through a circular pipe.   **(12 Marks)**

    b.   Water at 15°C flows between two parallel plates at a distance of 1.6 mm apart. Determine:
         (i) Maximum velocity   (ii) Pressure loss per unit length   (iii) Shear stress at the plate if the average velocity is 0.2 m/s. Viscosity of water at 15°C is 0.01 Poise. Take unit width of the plate.   **(08 Marks)**

Module-4

7   a.   Define the following with respect to boundary layer:
         (i)   Boundary layer thickness   (ii) Displacement thickness
         (iii) Momentum thickness   (iv) Energy thickness   **(08 Marks)**

    b.   Define Drag and Lift.   **(04 Marks)**

    c.   A flat plate 2m × 2m movers with a velocity of 50 km/hr in air of density 1.15 kg/m³. If the coefficient of list and drag are 0.75 and 0.15 respectively, calculate:
         (i)   Drag force   (ii) Lift force
         (iii) Resultant force   (iv) Power exerted on the plate   **(08 Marks)**

OR

8   a.   Explain the following similarities:
         (i)   Geometric similarity
         (ii) Kinematic similarity
         (iii) Dynamic similarity   **(10 Marks)**

    b.   The frictional torque T of a disc of diameter D rotating at a speed N in a fluid of viscosity μ and density ρ in a turbulent flow is given by $T = \rho N^2 D^5 \phi \left[\dfrac{\mu}{\rho ND^2} \right]$. Prove this by using Buckingham's π - theorem method.   **(10 Marks)**

Module-5

9   a.   Define Mach number. Explain the significance of Mach number in compressible fluid flow.   **(06 Marks)**

    b.   Derive an expression for the velocity of a sound wave in a compressible fluid in terms of change of pressure and change of density.   **(08 Marks)**

    c.   A projectile travel in air of pressure 10.1043 N/cm² at 10°C at a speed of 1500 km/hr. Find the Mach number and Mach angle. Take γ = 1.4 and R = 287 J/kgK.   **(06 Marks)**

OR

10 a.   Define stagnation temperature and stagnation pressure. Derive the relation between them in terms of Mach number.   **(08 Marks)**

    b.   What is CFD? Mention the applications of CFD.   **(06 Marks)**

    c.   List any six limitations of CFD.   **(06 Marks)**

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18ME44

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Fourth Semester B.E. Degree Examination, June/July 2023
Kinematics of Machines

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 :
   i) Link   ii) Kinematic pair   iii) Mechanism   iv) Degree of freedom   v) Inversion
   (10 Marks)

   b. Explain with a neat sketch, the crank and slotted lever mechanism.   **(10 Marks)**

OR

2 a. What is completely constrained motion and partially constrained motion? Explain with example.   **(05 Marks)**

   b. State Grashoff's law and list inversions of Grashoff's chain.   **(05 Marks)**

   c. With a neat sketch explain, Ackermann steering gear mechanism.   **(10 Marks)**

Module-2

3 a. In a slider crank mechanism, the crank OB is 30mm long and the connecting rod BC is 120mm long. The crank rotates at a uniform speed of 300 rpm clockwise about center 'O'. For a crank position $\underline{BOC}$ equal to 60° draw the configuration and find

   (i) Velocity of piston C and angular velocity of connecting rod BC.
   (ii) Acceleration of piston C and angular acceleration of connecting rod BC.   **(16 Marks)**

   b. Define instantaneous center and state the types of instantaneous centers.   **(04 Marks)**

OR

4 a. State and prove Kennedy's theorem.   **(08 Marks)**

   b. A four bar mechanism ABCD has AB = 20cm, BC = 30cm, CD = 32 cm and AD = 60cm. Crank AB rotates at a uniform speed of 300 r.p.m in anticlockwise direction. When the crank AB has turned 60°, locate all the instantaneous centers and find the angular velocity of link BC, where AD is fixed.   **(12 Marks)**

Module-3

5 a. What is meant by Loop-Closure equation? Deduce the loop closure equation for the closed loop of a four bar mechanism.   **(10 Marks)**

   b. The crank of an engine is 50 cm long and the connecting rod length to crank radius is 4. Determine the velocity of the piston, when the crank has turned through 40° from top dead center position. The crank is rotating at 100 rad/sec in clockwise direction. By complex algebra analysis method, find out the velocity of the piston.   **(10 Marks)**

OR

6 a. Explain the following with a diagram wherever required:
   i) Function generation
   ii) Precision points
   iii) Structural error
   iv) Mechanical error
   (08 Marks)

41

1 of 2

b. A schematic of a four bar mechanism with input link 'a' and output link 'c' is shown in Fig.Q6(b). The angles θ and φ for three successive positions are given in the table below:

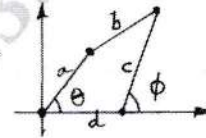| Angles	1	2	3
θ	55	25	-25
φ	110	40	-50

Fig.Q6(b)

If the length of the grounded link 'd' is 40mm, using Frendenstein's equation, find out length of other links to satisfy the given positional conditions. **(12 Marks)**

Module-4

7   A cam with 30mm as minimum radius is rotating clockwise at a uniform speed of 1200 rpm and has to give the motion to the knife edge follower as follows:
i) Follower to move outward through 30mm during 120° of CAM rotation with SHM.
ii) Dwell for the next 60°.
iii) Follower to return to its starting position during the next 90° with SHM.
iv) Dwell for the remaining period.
Draw the CAM profile when the follower axis passes through CAM axis. Also find the maximum velocity and acceleration during the outward and return stroke. **(20 Marks)**

OR

8   A cam rotating clockwise at uniform speed of 300 rpm operates a reciprocating follower through a roller 1.5 cm diameter. The follower motion is defined as below:
i) Outward during 150° with UARM
ii) Dwell for next 30°
iii) Return during next 120° with SHM.
iv) Dwell for the remaining period.
Stroke of the follower is 3cm. Minimum radius of cam is 3cm. Draw the cam profile when the follower axis passes through cam axis. **(20 Marks)**

Module-5

9   a. State and prove the law of gearing for constant velocity ratio. **(10 Marks)**
   b. Two involute gears with number of teeth 28 and 45 are in mesh. If they have standard addendum of 3 mm and pressure angle is 20°, find the following ;
   i) Path of approach   ii) Path of recess   iii) Contact ratio
   Assume module is 3mm. **(10 Marks)**

OR

10 The arm C of an epicyclic gear train rotates at 100 rpm in anticlockwise direction. The arm carries two wheels A and B having 36 and 45 teeth respectively. The wheel A is fixed and the arm rotates about the center of wheel A. Find the speed of wheel B. What will be the speed of B, if wheel A instead of being fixed makes 200 rpm clockwise? **(20 Marks)**

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CBCS SCHEME

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18ME45B/18MEB405

Fourth Semester B.E. Degree Examination, June/July 2023
Metal Casting and Welding

Time: 3 hrs.

Max. Marks: 100

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

Module-1

1. a. Define manufacturing process. Explain steps involved in casting process. **(08 Marks)**
   b. What is pattern? Explain various pattern allowances with their importance in manufacturing. **(08 Marks)**
   c. List various ingredients of moulding sand. Brief about their effect on mould preparation. **(04 Marks)**

OR

2. a. Explain squeeze moulding process with a neat sketch. **(08 Marks)**
   b. List important sand moulding processes. Explain investment moulding process. **(08 Marks)**
   c. Define core. List different types of cores and gates. **(04 Marks)**

Module-2

3. a. Classify furnaces. Explain working of coreless induction furnace with a neat sketch. **(10 Marks)**
   b. With a neat sketch explain construction and working principle of cupola furnace. **(10 Marks)**

OR

4. a. What is a die? Explain gravity die casting process with a sketch. **(08 Marks)**
   b. Explain continuous casting process with a sketch and name the products manufactured by this process. **(08 Marks)**
   c. Differentiate between sand moulds and metal moulds. **(04 Marks)**

Module-3

5. a. Define Solidification. List and explain solidification variables. **(08 Marks)**
   b. What is directional solidification? Explain the methods of achieving directional solidification. **(08 Marks)**
   c. What is degasification? List the various methods of degassing. **(04 Marks)**

OR

6. a. List various casting defects with their causes, remedies and features. **(08 Marks)**
   b. Explain the manufacturing of Aluminium alloy casting, using Stir Casting setup. **(06 Marks)**
   c. Write a note on : (i) Grain Refining (ii) Pouring Temperature **(06 Marks)**

Module-4

7. a. Define Welding. Mention its classification and applications. **(06 Marks)**
   b. Explain the working principle of Flux Shielded metal arc welding process. **(07 Marks)**
   c. Explain TIG welding process. **(07 Marks)**

1 of 2

43

OR

8 a. Explain Spot welding process. (07 Marks)
   b. Explain Thermit welding process. (07 Marks)
   c. Explain Electron Beam Welding process without sketch. (06 Marks)

Module-5

9 a. What is HAZ? Explain parameters affecting HAZ. (05 Marks)
   b. Write a note on residual stresses developed in welding. (05 Marks)
   c. List various welding defects with their causes and remedies. (10 Marks)

OR

10 a. Compare soldering and brazing. (04 Marks)
   b. Explain Oxy-Acetylene welding process. (06 Marks)
   c. Explain magnetic particle inspection method. (10 Marks)
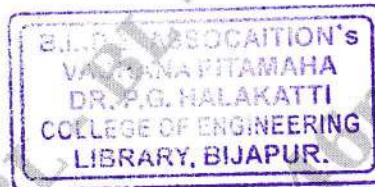
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44

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18MAT41

Fourth Semester B.E. Degree Examination, June/July 2023
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. Find analytic function u + iv, where u is given to be $u = e^x[(x^2 - y^2)\cos y - 2xy\sin y]$. **(06 Marks)**

   b. Derive Cauchy Reimann equations in polar form. **(07 Marks)**

   c. Show that $u = e^{2x}[x\cos 2y - y\sin 2y]$ is harmonic. Find the analytic function $f(z) = u + iv$. **(07 Marks)**

OR

2 a. Derive Cauchy Reimann equation in Cartesian form. **(06 Marks)**

   b. Determine analytic function $f(z) = u + iv$ if $u - v = e^x[\cos y - \sin y]$. **(07 Marks)**

   c. Show that $w = z^n$ is analytic and hence find its derivative. **(07 Marks)**

Module-2

3 a. Discuss the transformation $w = z + \dfrac{1}{z}, z \neq 0$. **(06 Marks)**

   b. Find the Bilinear transformation which maps the points $z = 1, i, -1$ onto $w = 0, 1, \infty$. **(07 Marks)**

   c. Evaluate $\displaystyle\int_0^{2+i} (\bar{z})^2\, dz$ along   i) line $y = x/2$ ii) real axis to 2 and then vertically to $2 + iy$. **(07 Marks)**

OR

4 a. Discuss the transformation $w = z^2$. **(06 Marks)**

   b. State and prove Cauchy's integral formula $f(a) = \dfrac{1}{2\pi i}\displaystyle\int_C \dfrac{f(z)}{(z-a)}\, dz$. **(07 Marks)**

   c. Evaluate using Cauchy's integral formula.
$$\int_C \frac{e^{2z}}{(z-1)(z-2)}\, dz \quad C : |z| = 3.$$
(07 Marks)

Module-3

5 a. Define: i) Random variable   ii) Discrete probability distribution with an example. **(06 Marks)**

   b. The probability that man aged 60 will live upto 70 is 0.65. What is the probability that out of 10 men, now aged 60   i) Exactly 9   ii) atmost 9   iii) Atleast 7 will live up to age of 70 years. **(07 Marks)**

   c. In a normal distribution, 3% of items are under 45 and 8% are over 64. Find the mean and standard deviation, given that A(0.5) = 0.19 and A(1.4) = 0.42. **(07 Marks)**

45

OR

6   a.   The probability distribution of a finite random variable X is given by

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

Find 'K', mean and variance of X.

(06 Marks)

   b.   If probability of bad reaction from certain injection is 0.001. Determine the chance that out of 2000 individuals more than two will get bad reaction, and less than two will get bad reaction.

(07 Marks)

   c.   The frequency of accidents per shift in a factory is shown in the following table:

Accidents per shift	0	1	2	3	4
Frequency	192	100	24	3	1

Calculate mean numbers of accidents per shift. Find the corresponding Poisson distribution.

(07 Marks)

Module-4

7   a.   Fit a second degree parabola $y = a + bx + cx^2$ for the following data:

x	0	1	2	3	4	5
y	1	3	7	3	21	31

(06 Marks)

   b.   Find the coefficient of correlation, lines of regression of x on y and y on x. Given,

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

(07 Marks)

   c.   If θ is an acute angle between line of regression, then show that $\tan\theta = \dfrac{\sigma x}{\sigma_x^2 + \sigma_y^2}\left(\dfrac{1-r^2}{r}\right)$.
Indicate the significance of the cases r = 0 and r = ±1.

(07 Marks)

OR

8   a.   Fit the curve of the form ax^b and hence estimate y when x = 8.

x	5	10	15	20	25	30	35
y	2.76	3.17	3.44	3.64	3.81	3.95	4.07

(06 Marks)

   b.   Find the rank correlation coefficient for the following data:

x	93	44	53	08	71	81	6	10	32	31
y	45	62	12	28	92	84	73	3	51	32

(07 Marks)

   c.   With the usual notations compute $\bar{x}$, $\bar{y}$ and r from the following lines of regression:
$y = 0.516x + 33.73$ and $x = 0.512y + 32.52$.

(07 Marks)

Module-5

9   a.   The joint probability distribution for following data

X \ Y	-2	-1	4	5
1	0.1	0.2	0	0.3
2	0.2	0.1	0.1	0

Determine the marginal distributions of X and Y also calculate E(x), E(y), COV (xy).

(06 Marks)

   b.   Define: i) Null hypothesis   ii) Confidence limits   iii) Type I, Type II errors.

(07 Marks)

c. The following table gives the distribution of digits in the numbers chosen at random from a telephone directory:

| Digits	0	1	2	3	4	5	6	7	8	9
Frequency	1026	1107	997	966	1075	933	1107	972	964	853

Test whether the digits may be taken to occur equally frequently in the directory.
(given $\chi^2_{0.05} = 16.92$ at n = 9). **(07 Marks)**

OR

10 a. A fair coin is tossed thrice. The random variable X and Y are defined as follows. X = 0 or 1 according as head or tail occurs on first loss, Y = number of heads.
  i) Determine distribution of X and Y.
  ii) Joint probability distribution of X and Y.
  iii) Expectation of X, Y and XY. **(06 Marks)**

b. It is claimed that a random sample of 49 tyres has a mean life of 15200km. Is the sample drawn from population whose mean is 15,150km and standard deviation is 200km? Test the significance level at 0.05 level. **(07 Marks)**

c. Ten individuals are choosen at random from the population and their height in inches are found to be 63, 63, 66, 67, 68, 69, 70, 70, 71, 71. Test the hypothesis that the mean height of universe is 66′ (value of $t_{0.05} = 2.262$ for 9.D.F). **(07 Marks)**

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47

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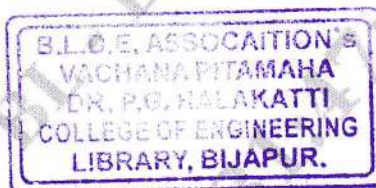
Question Paper Version : A

Third/Fourth Semester B.E Degree Examination, June/July 2023
Constitution of Indian, Professional Ethics and Cyber Law
(COMMON TO ALL BRANCHES)

Time: 2 hrs.]   [Max. Marks: 100

INSTRUCTIONS TO THE CANDIDATES

1. Answer all the hundred 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.

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1. The constitution of India was enacted by a constitution assembly set up,
   a) Union Cabinet mission plan 1946.
   b) Under Indian Independence Act 1947
   c) Under resolution of provincial government.
   d) By Indian National Congress.

2. On December 11, 1946 the Constituent Assembly elected _____ as its permanent chairman.
   a) Jawaharlal Nehru   b) Dr. Rajendra prasad
   c) Dr. B. R. Ambedkar   d) K. M. Munshi

3. The drafting committee of the constitution including the chairman comprised of,
   a) 7 members   b) 9 members
   c) 11 members   d) 5 members

4. The constitution of India is,
   a) Rigid   b) Flexible
   c) Partly rigid partly flexible   d) Very very rigid

5. The preamble of constitution declares India to be,
   a) Sovereign democratic republic
   b) Socialist democratic republic
   c) Sovereign, Socialist, Secular democratic and Republic
   d) None of these

48

6. In which case did the supreme court give a ruling preamble was part of the constitution.
   a) Berubari case
   b) Golaknath case
   c) Keshavananda Bharathi case
   d) None of these

7. What is the chief source of political powers in the country?
   a) The constitution
   b) The people
   c) The legislature
   d) The parliament

8. The original constitution classified. The "Fundamental Rights" into seven categories but now there are.
   a) 4 categories
   b) 5 categories
   c) 6 categories
   d) 7 categories

9. Which one of the following fundamental Right was described by Dr.B.R. Ambedkar as "the heart and soul of constitution".
   a) Right to Equality
   b) Right to constitutional Remedies
   c) Right to Freedom
   d) Right to Religion

10. The main objective of cultural and educational right granted to the citizens is,
    a) To preserve rich cutlture and heritage of India.
    b) To evolve single integrated Indian culture
    c) To help minorities to conserve their culture.
    d) All the above

11. For enforcement of fundamental Right the court can issue,
    a) A Decree
    b) An ordinance
    c) A writ
    d) A notification

12. Which of the following literally means you may have the body,
    a) A Mandomus
    b) Habeaus corpus
    c) Prohibition
    d) Quo-warranto

13. "Equal work for equal pay" is a
    a) Fundamental Right
    b) Directive principle
    c) Fundamental duty
    d) Statutory provision is labour law

14. 73rd and 74th amendment is pertaining to
    a) Stalehood of Goa
    b) Extention of reservation to SC and ST
    c) Local self government
    d) Land reforms

15. The enforcement of Directive principles depends upon,
    a) The resources available with the Government
    b) The president
    c) The Court
    d) Chief justice of India

16. Common Civil code means,
    a) Common civil procedure code
    b) Common civil law applicable to all
    c) Civil law applicable to common man
    d) None of the above

17. The concept of DPSP is borrowed from the constitution of,
    a) Ireland
    b) Russia
    c) Great Britain
   d) USA

18. The constitution of India adopted fundamental duty from,
    a) America   b) Russia   c) Ireland   d) Britain

19. Fundamental duties did not form to be original part of Indian constitution they were added under _____ amendment.
    a) 42nd Amendment Act   b) 44th Amendment Act
    c) 86th Amendment Act   d) None of these

20. At present how many "Fundamental duties" are their in the constitution of India.
    a) 6 duties   b) 8 duties   c) 10 duties   d) 11 duties

21. Article 370 which gave special status to Jammu and Kashmir existed in the Indian constitution because of the agreement between,
    a) Jawaharlal and Farukh Abdullah   b) Jawaharlal and Maharaja Hari sing
    c) Vallabh bhai Patel and Maharaj Harising   d) Mohammed Ali Jinnah and J.L.Nehru

22. Which is the Indian constitution day?
    a) Jan-26   b) August-15   c) November-26   d) April-20

23. Legislate means,
    a) Make law   b) Make constitutional amendment
    c) Form government   d) Put administrative machinery into action

24. The Parliamentary form of government in India is based on,
    a) Great Britain   b) Japan   c) Russia   d) France

25. What is the system used to elect the president of India?
    a) Preferential system   b) Secret Ballot
    c) Direct election   d) Proportional representation

26. Who discharge the duty of the president in the event of president and vice president being not available?
    a) The prime minister   b) The chief justice of India
    c) The speaker of lok sabha   d) Vice president

27. Who represents the nation but does not rule the nation?
    a) President   b) Attorney general   c) Chief Justice of India   d) Vice President

28. Which one of the following house is presided by a non member?
    a) Rajya Sabha   b) Lok Sabha   c) Vidhana Sabha   d) Vidhana parishad

29. Respite means,
    a) Painless death   b) Death due to drowning
    c) Due to stragulation   d) awarding lesser punishment

30. The total number of union council of minister including the prime minister shall not exceed.
    a) 10% of loksabha strength   b) 15% of loksabha strength
    c) 18% of loksabha strength   d) no such restriction

31. Uni-Cameral means,
    a) Presence of no house in the state
    b) Presence of one house in the state
    c) Presence of two house in the state
    d) Present of half house in the state

32. The age qualification for becoming the member of Rajya Sabha and Lok Sabha is,
    a) 25 yrs and 30 yrs
    b) 30 yrs and 25 yrs
    c) 35 yrs and 30 yrs
    d) 30 yrs and 40 yrs

33. The state legislative Assembly is prorogued by,
    a) Governor
    b) Chief minister
    c) Speaker of assembly
    d) Chief justice of High court

34. Which of the following statement is not correct?
    a) Money bill cannot be introduced in legislative council
    b) The money bill is presented by chief minister of the state
    c) The legislative council has no right to change the money bill
    d) All of the above

35. Power of the supreme court to decide the dispute between the centre and the state fall under its,
    a) Constitutional jurisdiction
    b) Appellate jurisdiction
    c) Advisory jurisdiction
    d) Original jurisdiction

36. The High court judge unless resign earlier retire at the age of,
    a) 58 years
    b) 60 years
    c) 62 years
    d) 65 years

37. A bill presented in the parliament becomes law.
    a) If passed by both the houses
    b) The prime minister has signed it
    c) The supreme court has decided or declared it.
    d) When the president gives his assent

38. The judges of Supreme Court after retirement are not permitted to carry on practice before.
    a) Supreme Court of India
    b) High Court
    c) District and Session Court
    d) Any of these

39. One third of Rajya Sabha member retires,
    a) Every year
    b) Every two year
    c) Every three years
    d) Every four years.

40. Which among following is not a standing committee?
    a) Public Committee
    b) Ethics Committee
    c) Railway convention Committee
    d) Business advisory Committee

41. Election to the local self government is conducted by,
    a) State Election Commission
    b) Regional EC
    c) Election commission
    d) Governor

42. The citizens of India have got a right to cast his vote after attaining the age of _____ years.
    a) 16 years
    b) 18 years
    c) 21 years
    d) 24 years

43. Election to Loksabha and Legislative Assembly in India are conducted on the basis of,
    a) Single transferable vote
    b) Proportional representation
    c) Limited Suffarage
    d) Audult franchise

44. The Election Commissioner hold office till,
    a) For 5 years
    b) For 6 years
    c) During the pleasure of president
    d) 6 years or 65 years whichever is early

45. This is not a ground to declare National Emergency.
    a) Internal disturbance
    b) War
    c) External agression
    d) Armed rebellion

46. How many times has a National Emergency has been declared so far?
    a) Once
    b) Twice
    c) Thrice
    d) Never

47. Break down of constitutional machinery in a state is popularly known as,
    a) State Emergency
    b) National Emergency
    c) Financial Emergency
    d) All of these

48. When National Emergency declared, the following Fundamental Right is suspended.
    a) Right to Equality (Art 14)
    b) Title (Art 18)
    c) Right to Freedom (Art 19)
    d) Right to life (Art 21)

49. Which type of emergency has not yet declared till now?
    a) National Emergency
    b) State Emergency
    c) Financial Emergency
    d) None of these

50. Who is considered to be a Vulnerable group?
    a) Women and Children
    b) SCs
    c) STs
    d) All of these

51. How many members will be nominated by President / Governor from Anglo Indian community?
    a) 2 / 1
    b) 1 / 2
    c) 3 / 2
    d) 2 / 3

52. Seats for SCs and STs are not reserved in,
    a) Lok Sabha
    b) Legislative Assembly
    c) Rajya Sabha
    d) All of these

53. Which of the Constitutional amendment reduced the voting right from 21 years to 18 years?
    a) 54th Amendment
    b) 36th Amendment
    c) 62th Amendment
    d) 61st Amendment

54. Which of the following amendment Act makes the Right to education as the fundamental right to all the children under the age of 6 to 14 years by inserting Art 21A to the constitution.
    a) 86th Amendment Act 2002
    b) 87th Amendment Act 2003
    c) 88th Amendment Act 2003
    d) 89th Amendment Act 2003

55. Which of the following amendment was passed during the emergency?
   a) 42nd Amendment Act
   b) 44th Amendment Act
   c) 47th Amendment Act
   d) 50th Amendment Act

56. In how many ways the constitutional amendments in India can take place?
   a) 2
   b) 3
   c) 4
   d) 5

57. The 7th Amendment of Indian constitution was done to implement recommendations of state on the basis of,
   a) linguistic
   b) Religion
   c) Population
   d) All of these

58. Which constitutional Amendment is done to pass the GST bill?
   a) 101st
   b) 120th
   c) 122nd
   d) 115th

59. The Ninety fourth Amendment of the constitution of India made provision for the appointment of minister in charge of tribal welfare in the state of,
   a) Bihar
   b) Chattisgarh and Jarkhand
   c) Madya Pradesh
   d) All the above

60. The 10th Amendment of the constitution of India Act 1961 incorporated _____ as seventh union territory of India.
   a) Dadar & Nagar Haveli
   b) Daman & Diu
   c) Andaman & Nicobar
   d) None of these

61. Engineering ethics is,
   a) Scientifically developed ethics
   b) Preventive ethics
   c) Developing ethics
   d) Natural ethics

62. A Fault tree is used to,
   a) Improve safety
   b) Take free consent
   c) Claim compensation
   d) Assess the risk involved

63. One of the characteristic of profession is
   a) It demands hard work
   b) It is based on honesty
   c) It is having taught competation
   d) usually its is having monopoly

64. One of impediment to responsibility is,
   a) Rampant corruption at higher level
   b) Self defection
   c) Interference by higher officers
   d) Interference by politicians

65. Good work means,
   a) Superior work done with great care and skill
   b) Work above and beyond the call of duty.
   c) Responsible work
   d) Work involving high risk

66. "Egocentric tendencies" means
   a) Interpreting situation from limited view
   b) Superior complex
   c) Arrogant and irresponsible behaviour
   d) habit of condemning the view of other

67. Tight couple means,
a) Erecting two pillars side by side
b) binding two beam tightly
c) Process tightly coupled
d) strong adhesive material

68. Lying is,
a) intentionally conveying false or misleading information
b) deception
c) False hood
d) None of these

69. Trimming is,
a) Smoothing of irregularities to make the data appear accurate and precise
b) Retaining the entire data
c) Consolidating the data
d) None of these

70. As applies to responsibility avoiding blame or being safe is the prime concern in,
a) Minimalistic approach
b) Considerable view
c) Good work view
d) Resonable care view

71. It is not a kind of trade mark.
a) symbols
b) designs
c) good will
d) sounds

72. Conflicts of interest may be,
a) potential
b) false
c) created
d) imaginary

73. The owner of patent right retains his patent right for _____ years.
a) 20   b) 50   c) 75   d) 100

74. _____ protects the expression of the Ideas but not the ideas themselves is,
a) Plagiarism   b) Patent   c) Copy right   d) Trade mark

75. Risk estimation can be done by,
a) Cooking   b) Trimming   c) Event tree   d) None of these

76. A compound measure of the probability and magnitude of adverse effect is known as,
a) benefit   b) risk   c) accident   d) compensation

77. The formula for MTR sambar masala is example of,
a) Patent   b) Copy right   c) Trade mark   d) Trade secret

78. Purpose of professional code is to,
a) Guide themselves
b) Educate the members
c) Discipline the members
d) All of these

79. What does NSPE stands for,
a) National science professional engineers b) National society of professional engineers
c) National science personal ethics   d) National society of professional educator

80. The obligation and prerogatives associated with a specific role is referred to as,
a) duty   b) responsibility   c) role morality   d) none of these

54
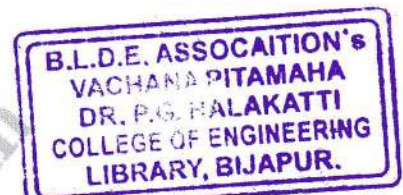
81. The first publicity available internet service in India was launched by _____ on 15 August 1995.
    a) Bharath Sanchar Nigam limited
    b) Videsh Sanchar Nigam limited
    c) Indian Institute of technology
    d) None of these

82. Which is the Act which provides legal frame work for e-Governance in India?
    a) Indian Penal Code
    b) IT (amendment) Act 2008
    c) IT Act 2000
    d) None of these

83. Which of the following is an example of Intellectual property?
    a) Trade mark   b) Copy right   c) Patent   d) All of the these

84. Which is the appeal court on the orders issued by cyber appealate tribunal?
    a) Munciff court   b) District court   c) High court   d) Supreme court

85. What are the types of cyber terror capability?
    a) Simple unstructured
    b) Simple unstructured and Advanced structured
    c) Complex co-ordinated
    d) Simple unstructured, Advanced structured, Complex co-ordinated

86. The mechanism for establishing net neutrality in India are at present mainly enforced by the,
    a) Telecom Regulatory Authority of India (TRAI)
    b) Bharatiya Sanchar Nigam Ltd. (BSNL)
    c) Videshi Sanchar Nigam Ltd. (VSNL)
    d) All the above

87. An attempt to harm damage or cause threat to a system or network is broadly termed as,
    a) Cyber crime   b) System hijacking   c) Cyber attack   d) Digital crime

88. Criminal minded individuals who work for terrorist organization and stean information if nation are,
    a) State sponspored hackers
    b) Cyber terrorist
    c) Blue hat hackers
    d) White hat hackers

89. Cyber crimes can be classified into,
    a) 2   b) 3   c) 4   d) 5

90. What is the updated version of IT Act 2000?
    a) IT Act 2007
    b) IT Act 2008
    c) Advanced IT Act 2002
    d) Advanced IT Act 2001

91. TRAI has ruled in favour of,
    a) Net neutrality   b) Airtel zero   c) Free basics   d) None of the these

92. Which of the following is not a type of cyber crime,
    a) Data theft
    b) Forgery
    c) Damage to Data and System
    d) Installing antivirus for protection

93. The imaginary location where the word of the parties meet in conversation is referred to as,
    a) cyber space   b) Cyber net   c) Space   d) Cyber dyne

94. Nitizen means,
a) A person who is citizen of a country
b) A person who has dual citizenship
c) A person who uses internet
d) None of these

95. What is the punishment for hacking of computers?
a) Three years imprisonment or 10 lac rupees or both
b) Life imprisonment
c) Three lac rupees or 3 years imprisonment
d) Three years imprisonment or 5 lac rupees penalty or both

96. What is the proposed punishment for cyber Terrorism in IT Act?
a) 1 crore rupees penalty
b) Life imprisonment
c) 10 years imprisonment
d) 6 years imprisonment

97. What is the term of office of the presiding officer of cyber appellate tribunal?
a) 3 years
b) 4 years
c) 5 years
d) 6 years

98. What is the full form of ITA 2000?
a) Information tech act 2000
b) Indian technology act 2000
c) International technology act 2000
d) Information technology Act 2000

99. The first computer virus is,
a) I love you
b) Blaster
c) Sasser
d) Creeper

100. Who is usually against net neutrality,
a) Content providers
b) Consumers / end users
c) telecom companies
d) All of these

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CBCS SCHEME

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21ME42

Fourth Semester B.E. Degree Examination, June/July 2023
Machining Science and Jigs & Fixtures

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 working principle of lathe. How can you specify a lathe? **(06 Marks)**
   b. Explain with neat sketch, the working of Radial drilling machine. **(08 Marks)**
   c. Explain briefly with sketches at any three drilling operation. **(06 Marks)**

OR

2. a. Draw the engine lathe and cable the parts and discuss the function of lathe parts. **(10 Marks)**
   b. Difference between upmilling and down milling process. **(05 Marks)**
   c. With a neat sketch, explain construction and working of common grinding machine. **(05 Marks)**

Module-2

3. a. Distinguish between orthogonal and oblique cutting with a neat sketch. **(06 Marks)**
   b. List and explain different types of chips formed in metal cutting process. **(08 Marks)**
   c. Sketch and explain single point turning tool geometry. **(06 Marks)**

OR

4. a. List and explain different types of cutting tool materials and state their specific applications. **(06 Marks)**
   b. Draw a merchant's circle diagram, using usual notations and state the assumptions. **(08 Marks)**
   c. List the various types of cutting fluids used in metal cutting briefly. Explain. **(06 Marks)**

Module-3

5. a. What is machinability? Define machinability index. **(04 Marks)**
   b. What are the factors affecting on tool life? **(06 Marks)**
   c. Explain the process of Electroplating. **(10 Marks)**

OR

6. a. Describe the importance of surface finish process. **(04 Marks)**
   b. With a neat sketch, explain the Honing process. **(06 Marks)**
   c. Briefly explain powder coating and Galvanizing process. **(10 Marks)**

Module-4

7. a. Explain with neat sketch the process of Abrasive Jet Machining. **(10 Marks)**
   b. Explain with neat sketch the process of ultrasonic machining process. **(10 Marks)**

57

OR

8 a. Explain with neat sketch of Electro Discharge machining. **(10 Marks)**

b. Explain with neat sketch of Laser beam machining. **(10 Marks)**
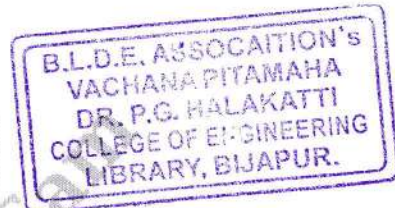
Module-5

9 a. What are the importances of Jigs and Fixtures in industries? **(06 Marks)**

b. List the types of Jigs and Fixtures. **(06 Marks)**

c. What are the materials used to manufacture Jigs and Fixtures? **(08 Marks)**

OR

10 a. What are the factors to be considered to design Jigs and Fixtures? **(06 Marks)**

b. Briefly explain on Template, Plate, Channel in Jigs. **(06 Marks)**

c. Briefly explain the importance of fixtures in milling and turning. **(08 Marks)**

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CBCS SCHEME

USN ☐☐☐☐☐☐☐☐☐☐ **21ME43**

Fourth Semester B.E. Degree Examination, June/July 2023
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. Explain the following terms:
   (i) Total pressure   (ii) Centre of pressure
   (iii) Gauge pressure   (iv) Buoyancy   **(08 Marks)**
   b. Derive expression for total pressure force and centre of pressure act on a vertical surface immersed in static fluid.   **(08 Marks)**
   c. Discuss on fluid pressure measuring devices.   **(04 Marks)**

OR

2 a. Explain the Eulerian and Langragian method of fluid flow analysis with suitable example.
                                                                         (08 Marks)
   b. Derive the 3-dimensional flow continuity equation in cartesian coordinates.   **(08 Marks)**
   c. Calculate the velocity of fluid flow at a point (2, 3) if its 2-D flow stream function is given by $\psi = 2xy$.   **(04 Marks)**

Module-2

3 a. Derive the Euler's equation of fluid motion and hence deduce Bernoulli's equation.
                                                                         (10 Marks)
   b. Derive an expression for discharge through venturimeter.   **(10 Marks)**

OR

4 a. Derive expression for discharge through a triangular notch.   **(10 Marks)**
   b. A horizontal venturimeter of 20 cm inlet diameter and 10 cm throat diameter is used to measure an oil flow. The discharge of oil through venturimeter is 60 lit/s. Calculate the reading of oil-mercury differential manometer. Take $C_d = 0.98$ and specific gravity = 0.8.
                                                                         (10 Marks)

Module-3

5 a. Derive Hagen Poiseulle equation for laminar flow through a circular pipe.   **(10 Marks)**
   b. A crude oil flowing through a horizontal circular pipe of 10 cm diameter and 100 cm length. Assume laminar flow and calculate pressure drop if 100 kg oil collected in a tank in 30 seconds. Take viscosity = 0.97 N-S/m^2 and specific gravity = 0.9.   **(10 Marks)**

OR

6 a. Discuss the energy losses that occur in pipe flow.   **(10 Marks)**
   b. Derive Darcy-Weisbach equation for determining loss of head due to friction.   **(10 Marks)**

Module-4

7 a. Explain the following terms:
   (i) Boundary layer thickness   (ii) Streamline body   (iii) Bluff body
   (iv) Lift   (v) Drag

b. Deduce an expression for pressure drop (dp) in a pipe flow using Buckingham's π - theorem if fluid has velocity (V), viscosity (μ) and density (ρ). Consider pipe diameter (D) and length (L).

(10 Marks)

OR

8 a. Explain the following terms:
   (i) Reynold's number   (ii) Froude's number   (iii) Euler's number
   (iv) Weber's number   (v) Mach number

(10 Marks)

b. A flat plate 1.5 m × 1.5 m moves at 50 km/hr in stationary air of density 1.15 kg/m³. The coefficients of drag and lift are 0.15 and 0.75 respectively. Compute:
   (i)   Lift force
   (ii) Drag force
   (iii) Resultant force
   (iv) Power required to keep the plate in motion.

(10 Marks)

Module-5

9 a. Show that velocity of elastic wave propagation in an adiabatic medium is given by $C = \sqrt{\gamma RT}$.

(10 Marks)

b. A projectile travels in air of pressure 100 kPa at 10°C with a speed of 1500 km/hr. Compute the Mach number and Mach angle. Take $\gamma = 1.4$ and R = 287 J/kg-K.

(10 Marks)

OR

10 a. Explain the necessity, applications and limitations of CFD.

(10 Marks)

b. A projectile travels with a speed of 1500 km/hr at 20°C temperature and 0.1 MPa air pressure. Calculate the Mach number and Mach angle. Take $\gamma = 1.4$ and R = 287 J/kg-K.

(10 Marks)

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60

USN

21ME44

Fourth Semester B.E. Degree Examination, June/July 2023
Mechanics and Materials

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 terms :
   i) Elasticity   ii) Stress   iii) Strain   iv) Young's modulus   v) Poison's ratio.   **(05 Marks)**

   b. Derive an expression for extension of the uniformly tapered circular bar subjected to an axial load.   **(05 Marks)**

   c. A member ABCD is subjected to point loads P_1, P_2, P_3 and P_4 as shown in Fig.Q1(c). Calculate the force P_2 necessary for equilibrium if $P_1 = 45kN$, $P_3 = 450kN$ and $P_4 = 130kN$. Determine stresses in each member and also determine the total elongation of the member assuming the $E = 2.1 \times 10^5 N/mm^2$.
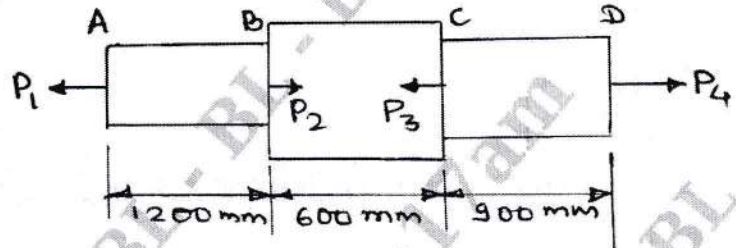

Fig.Q1(c)

(10 Marks)

OR

2 a. Derive relationship between modulus of elasticity and modulus of rigidity.   **(10 Marks)**

   b. A compound bar is made up of a central steel plate 50mm wide and 10mm thick to which copper plate 50mm wide and 5mm thick are connected rigidly on each side. The length of the compound bar at room temperature is 1000mm. If the temperature is raised by $100°C$, determine the stress in each material and change in length of the compound bar. Assume $E_{st} = 200GPa$, $E_{CO} = 100GPa$.   **(10 Marks)**

Module-2

3 a. Derive an expression for the normal stress and shear stress on a plane inclined at 'θ' to the vertical axis in a biaxial stress system.   **(10 Marks)**

   b. An element with the stresses acting on it as shown in Fig.Q3(b). Determine :
   i) Principal stresses and its locations
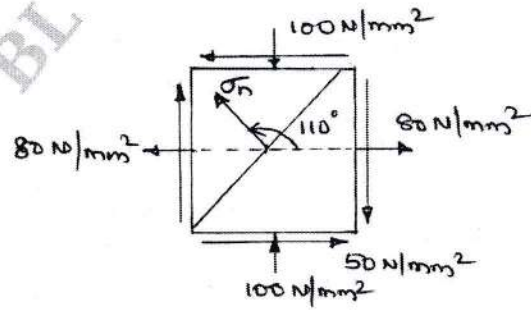   ii) Maximum shear stresses and its locations.

Fig.Q3(b)   **(10 Marks)**

61

OR

4   The state of stress at a point in a strained material is shown in Fig.Q4. Determine :
 a. Stresses on a plane whose normal is at an angle of 45° with reference to 80N/mm² stress direction
 b. Magnitude of principal stresses and their location
 c. Maximum and minimum shear stress and their location
 d. Draw Mohr's circle and verify the results obtained analytically.
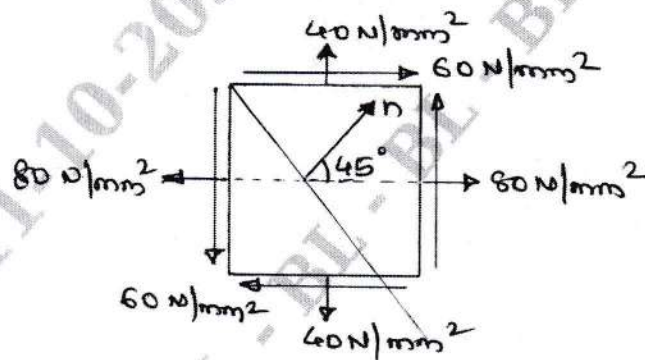

Fig.Q4   (20 Marks)

Module-3

5   a. Obtain expressions relating load, shear force and bending moment.   (05 Marks)
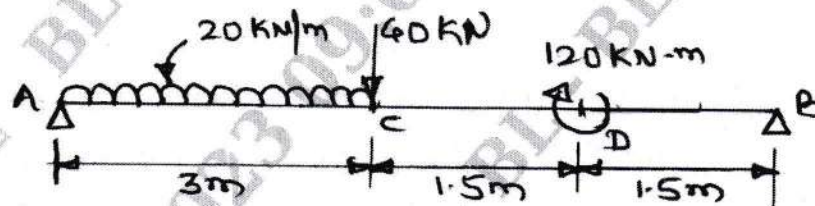   b. Draw the shear force and bending moment diagram for the beam shown in Fig.Q5(b).

Fig.Q5(b)   (15 Marks)

OR

6   a. Derive the equation $\dfrac{M}{I} = \dfrac{\sigma_b}{Y} = \dfrac{E}{R}$ with usual notations. State the assumptions in the derivation.   (10 Marks)
    b. A beam having T-section with its flanges of 180mm × 10mm and web of 220mm × 10mm is subjected to sagging bending moment 15kN-m. Determine the maximum tensile stress and maximum compressive stress, and their location in the section.   (10 Marks)

Module-4

7   a. Derive differential equation for deflection of beam.   (10 Marks)
    b. Determine slope and deflection for a cantilever beam of length L and subjected to UDL W/unit length.   (10 Marks)

62

OR

8 a. State assumptions and derive the torsional equation $\dfrac{T}{J} = \dfrac{\tau}{R} = \dfrac{G\theta}{L}$. **(10 Marks)**

  b. A hollow shaft of diameter ratio 3/8 is required to transmit 588kW at 110rpm, the maximum torque being 120% of the mean. Shear stress is not exceed 63N/mm² and twist in a length of 3m not to exceed 1.4° calculate external diameter of shaft which would satisfy these conditions. Take modulus of rigidity as 84GPa. **(10 Marks)**

Module-5

9 a. Derive an expression for circumferential stress and longitudinal stress for a thin cylinder. **(10 Marks)**

  b. Derive an expression for strain energy for a member subjected to axial load. **(05 Marks)**

  c. A steel bar 15mm diameter is pulled axially by a force of 10kN. If the bar is 250mm long, calculate the strain energy stored per unit volume of the bar and total strain energy stored by the bar. Take $E = 2 \times 10^5$ N/mm². **(05 Marks)**

OR

10 a. Obtain the expression for Euler's critical load for a long column with both ends hinged. Also state assumptions made. **(10 Marks)**

  b. A thick cylinder with internal diameter 80mm and external diameter 120mm is subjected to an external pressure of 40N/mm² when the internal pressure is 120N/mm². Plot the variation of circumferential stress and radial pressure on the thickness of the cylinder. **(10 Marks)**
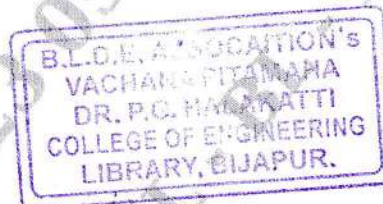
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CBCS SCHEME

21BE45

USN ☐☐☐☐☐☐☐☐☐☐

Fourth Semester B.E./B.Tech. Degree Examination, June/July 2023
Biology for Engineers

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.

			M	L	C
Module – 1					
Q.1	a.	What is a biomolecule? Explain the classification of biomolecule.	07	L2	CO1
	b.	Explain the role of DNA vaccine for rabies and RNA vaccine for COVID-19.	07	L2	CO1
	c.	Write a short note on cellulose based bio-filters.	06	L2	CO1
OR					
Q.2	a.	Explain the DNA finger printing in forensic applications.	07	L2	CO1
	b.	Explain the role of lipids and its application in cleaning agents.	07	L2	CO1
	c.	Write a short note on biosensors and bioplastics.	06	L2	CO1
Module – 2					
Q.3	a.	Explain brain as a CPU system.	07	L3	CO1
	b.	Explain eye as a camera system.	07	L3	CO1
	c.	Write a short note on cardiac pacemaker.	06	L2	CO1
OR					
Q.4	a.	Explain the robotic arms for prosthetics.	07	L3	CO1
	b.	Explain heart as a pump system.	07	L3	CO1
	c.	Write a short note on engineering solutions for Parkinson's disease.	06	L2	CO1
Module – 3					
Q.5	a.	Explain the lungs as a purification system.	07	L3	CO2
	b.	Explain the kidney as filtration system.	07	L3	CO2
	c.	Write a short note on spirometry and ventilator.	06	L2	CO2
OR					
Q.6	a.	Explain muscular and skeletal system as scaffolds.	07	L3	CO2
	b.	Explain bio-engineering solutions for muscular dystrophy and osteoporosis.	07	L3	CO2
	c.	Write a short note on Chronic Obstructive Pulmonary Disease (COPD).	06	L2	CO2
Module – 4					
Q.7	a.	Explain the terms Echolocation Ultrasonography and Sonars.	07	L3	CO3
	b.	Explain the process of Photosynthesis and Photovoltaic cells.	07	L3	CO3
	c.	Write a short note on Bionic leaf, GPS, Bird flight and aircraft.	06	L2	CO3
OR					
Q.8	a.	Explain the terms Lotus leaf effect, Plant Burrs and Super hydrophobic and self-cleaning surfaces.	07	L3	CO3
	b.	Explain the terms Spark skin and Swimsuits, Bullet train using biological concepts.	07	L3	CO3
	c.	Write a short note on Hemoglobin – Based Oxygen Carriers (HBOC's) and Perfluorocarbons (PFC).	06	L2	CO3
Module – 5					
Q.9	a.	Explain the DNA Organic and Biocomputing.	07	L3	CO4
	b.	Explain the Bioimaging and Artificial intelligence for Disease Diagnosis.	07	L3	CO4
	c.	Write a short note on Self healing Bioconcrete.	06	L2	CO4
OR					

64

CBCS SCHEME

21UH49

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Question Paper Version : **B**

Fourth Semester B.E./B.Tech. Degree Examination, June/July 2023
Universal Human Values

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.

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1. The feelings for those who have made effort for my excellence is _____
   a) Excellence   b) Reverence   c) Gratitude   d) Glory

2. There are _____ comprehensive human goals
   a) Eight (8)   b) Six (6)   c) Four (4)   d) Nine (9)

3. The first order of nature is _____
   a) Material order   b) Bio order
   c) Animal order   d) Human order

4. Developing ethical competence in the profession is the only effective way to ensure
   a) Responsibilities   b) Ethics
   c) Profession   d) Professional ethics

5. Ensuring justice in relationship, on the basis of values leads to _____ in society.
   a) Fearlessness   b) Trust
   c) Fearlessness and Trust   d) None of these

6. Human goal → match correctly
   A Right understanding   1 Individual
   B Prosperity   2 Family
   C Fearlessness (Trust)   3 Society
   D Co-existence   4 Nature/Existence
   a) 1 – D, 2 – A, 3 – B, 4 – C   b) 1 – B, 2 – C, 3 – D, 4 – A
   c) 1 – A, 2 – B, 3 – C, D – 4   d) 1 – C, 2 – D, 3 – A, 4 – B

7. The human goal at the level of family is
   a) Prosperity   b) Fearlessness
   c) Co-existence   d) Right understanding

8. Sah-astitua means _____
   a) Co-existence   b) Co-operation
   c) Co-option   d) Corporate identity

Version – B – 1 of 4

65

9. Acceptance of excellence in others is called
   a) Reverence
   b) Guidance
   c) Glory
   d) Gratitude

10. Each human being is co-existence of
    a) Spirit and Sanyam
    b) Health and prosperity
    c) Self and Body
    d) Mind and Soul

11. Who is responsible for happiness and unhappiness?
    a) Self
    b) Body
    c) Outside situation
    d) Society

12. Value education helps to
    a) Removes our contradictions
    b) Remove our confusions
    c) Bring harmony at all levels of human living
    d) All of these

13. Undivided society is ensured by
    a) Right understanding
    b) Physical facilities
    c) Relationship with right understanding
    d) None of these

14. The third order of nature is _____
    a) Material order
    b) Bio order
    c) Animal order
    d) Human order

15. Which is the complete value?
    a) Love
    b) Respect
    c) Trust
    d) Care

16. Body is a _____ unit while the self is a _____ unit.
    a) Material, Consciousness
    b) Consciousness, Material
    c) Material, Material
    d) Consciousness, Consciousness

17. Society is an extension of _____
    a) Human Being
    b) Family
    c) Nature
    d) Existence

18. In value education Sanyam mans _____
    a) Self-exploration
    b) Self-evolution
    c) Self-regulation
    d) None of these

19. To fulfill human aspirations _____ are necessary
    a) Both values and skills
    b) Values
    c) Skills
    d) None of these

20. The innateness of Bio order is _____
    a) Existence
    b) Cruelty / Non-cruelty
    c) Growth
    d) Nurture / Worsen

21. An individual people aspiring for the universal human order will be
    a) More responsible socially and ecologically
    b) More rich
    c) More powerful
    d) More well travel

22. A harmonious world is created by values at 4 levels there are
    a) Home, Family, Society, Universe
    b) Individual, Family, Society, Universe
    c) School, Home, Office, Temple
    d) None of these

23. "What is the innateness of Tulsi-Plant (or any plant)?
    a) Existence + Growth
    b) Cruelty/non-cruelty
    c) Nurture/Worsen
    d) Will to live in self

24. As individual people anticipates for the universal human order may be
    a) More rich
    b) More Powerful
    c) More responsible socially and ecologically
    d) More well-travelled

25. Understanding of human values leads to the practice of
    a) Responsibilities
    b) Ethics
    c) Profession
    d) Professional ethics

26. "Seeing the self by the self" means
    a) The consciousness observing the consciousness
    b) The consciousness observing the material
    c) The consciousness observing the co-existence
    d) None of these

27. Education-Right living leads to _____
    a) Right understanding
    b) Confusions
    c) Doubts
    d) None of these

28. There are _____ dimensions of living
    a) Six (6)
    b) Four (4)
    c) Nine (9)
    d) Five (5)

29. The second order of nature is _____
    a) Material order
    b) Bio order
    c) Animal order
    d) Human order

30. The innateness of material order is _____
    a) Existence
    b) Cruelty/Non-cruelty
    c) Growth
    d) Nurture/Worsen

31. Harmony should be maintained in
    a) Between body and life
    b) Between self and society
    c) Between life and environment
    d) All of these

32. Basic human aspirations are
    a) Continuous Happiness
    b) Prosperity
    c) Both a and b
    d) None of these

33. Purpose of value education is
    a) Foster universal core values
    b) Make the syllabus easy
    c) Develop values in individuals
    d) All of these

34. Knowing means having the
    a) Self exploration
    b) Self evaluation
    c) Right understanding
    d) Having knowledge of all

35. Happiness means
    a) To be in a state of harmony
    b) Fulfillment of desired expectations from others
    c) Fulfillment of desired feelings from others
   d) Fulfillment of desired sensations from body

36. _____ is called foundation value
    a) Respect   b) Affection   c) Love   d) Trust

37. The Human goal at the level of nature is
    a) Prosperity
    c) Co-existence
    b) Fearlessness
    d) Right understanding

38. The outcome of justice is _____
    a) Right understanding
    c) Trust and Fearlessness
    b) Prosperity
    d) Coexistence with nature

39. Society means
    a) Family
    c) Few individuals
    b) All human beings
    d) None of these

40. Feeling for those who have made effort for excellence is _____
    a) Excellence
    c) Glory
    b) Reverence
    d) None of these

41. Comprehensive human goal at the level of individual
    a) Prosperity
    c) Co-existence
    b) Fearlessness
    d) Right understanding

42. The fourth order of nature is
    a) Material   b) Bio order   c) Animal order   d) Human order

43. _____ is the basic unit of human society.
    a) Group   b) Individual   c) Nature   d) Society

44. Which of the following is a positive value?
    a) Self respect
    c) Fear
    b) Anger
    d) Narrow mindedness

45. What is the nature of self?
    a) Conscious
    c) Biochemical
    b) Physio-Chemical
    d) Semi-Conscious

46. Self exploration is seeing beyond
    a) Universe   b) House   c) Box   d) Your senses

47. Human to human interaction is called as
    a) Work   b) Behaviour   c) System   d) None of these

48. "All are our own, all are interconnected, interdependent" means.
    a) Oneness   b) Worship   c) Ease   d) None of these

49. Prosperity means
    a) Feeling of having more than required physical facility
    b) Feeling of having less physical facility
    c) Feeling of having more physical facility
    d) Deptrived of physical facility

50. Realization is the activity of
    a) Self
    c) Both self and Body
    b) Body
    d) None of these

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Version – B – 4 of 4

68

2018
V sem. ME

18ME51

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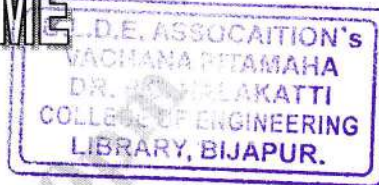
Fifth Semester B.E. Degree Examination, June/July 2023
Management and Economics

Time: 3 hrs.   Max. Marks: 100

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

Module-1

1 a. Define Management. Explain the nature and characteristics of management. **(10 Marks)**
   b. Write about roles of management and what are different level of management. **(10 Marks)**

OR

2 a. Explain the modern management approaches. **(10 Marks)**
   b. State and explain importance and purpose of planning process. **(10 Marks)**

Module-2

3 a. State and explain the principle of organization. **(10 Marks)**
   b. Explain with sketch line and staff organization. **(10 Marks)**

OR

4 a. Explain the techniques of selection of staffing. **(10 Marks)**
   b. Define controlling? Explain the methods of establishing sound controlling. **(10 Marks)**

Module-3

5 a. Explain how the problem solving process leading ultimately to a decision is carried out. **(06 Marks)**
   b. Define elasticity and explain the factors that influence elasticity of demand. **(06 Marks)**
   c. A person takes a loan of Rs.10,000/- from a Bank at Interest of 10% PA. Find the amount if,
      (i)   Interest is compounded annually.   (ii) Interest is compounded half yearly.
      (iii) Interest is compounded quarterly.   (iv) Interest is compounded monthly. **(08 Marks)**

OR

6 a. Draw the cash flow diagram for Lender and Borrowers. **(04 Marks)**
   b. An amount of Rs.1200 per year is to be paid into an account each for the next five years. Using Nominal Interest of 12% determine the total amount. The account will have at the end of 5th year under the following condition :
      (i) Deposit made at the end of each year with interest compounded monthly.
      (ii) Deposit made at the end of each year with interest compounded continuously. **(08 Marks)**
   c. The rights to a patent have been sold under an agreement in which annual year end payment of Rs.100,000 are to be made for the next 10 years what is the future sum of this annuity? What is the present worth of the annuity at an Interest rate 7 percent? **(08 Marks)**

Module-4

7 a. Briefly explain the condition for present worth comparision. **(05 Marks)**
   b. Explain IRR (Interest Rate of Return) and MARR (Minimum Acceptable rate of Return). **(05 Marks)**

69

c. Two holiday cottage are under consideration compare the present worth of the cost of 24 years service at an Interest rate of 5 percent, when neither cottage has a realizable salvage value.

Particular	Cottage-1	Cottage-2
First cost	Rs.4500	Rs.10,000
Estimated life	12 year	24 year
Annual maintenance cost	Rs.1000	Rs.720

(10 Marks)

OR

8 a. Stand by lighting generator is require for a shop. Two types are available.

Particular	Type-1	Type-2
First cost	Rs.5000	Rs.3200
Salvage value	Rs.1000	Nil
Annual operating cost	Rs.780	Rs.950

If both generator have a life of 4 years and the interest rate is 15 percent per year which offers the lowest equivalent annual cost?

(10 Marks)

b. Farm house can be purchased for Rs.90,000 and the expected resale value after 20 years is Rs.60,000. If the annual rental income is Rs.11,800 and expenses Rs.4700. What will be the rate of return earned on this farm house?

(10 Marks)

Module-5

9 a. Briefly explain the contents of element of cost.

(05 Marks)

b. A firm is producing 100 units per day. The direct material cost is fund to be Rs.160. The direct labour cost is Rs.200 and Factory over heads chargeable to it is Rs.250. If the selling expenses are 40% of the factory cost. What must be selling price of each unit to realize a profit of 15% of the selling price?

(07 Marks)

c. A mild steel component as shown in a Fig. Q9 (c) below is to be manufactured. Find the Total cost of material the density of material is 7.81 gm/cm³. The cost of material is Rs.60/kg. All dimensions are in cm.
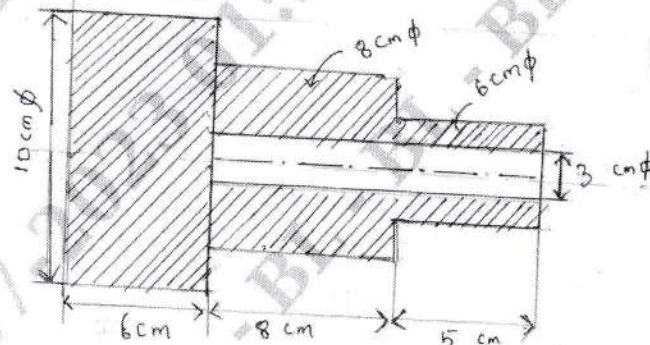

Fig. Q9 (c)

(08 Marks)

OR

10 a. Briefly explain the following methods of depreciation:
   (i) Diminishing balance method
   (ii) Sinking fund method.

(10 Marks)

b. A CNC machine costs Rs.30,00,000 is estimated to serve 8 years after which its salvage value is estimated to be Rs.2,50,000. Find
   (i) Depriciation fund at the end of the 5th year by fixed percentage method and declining balance method.
   (ii) Book value of the machine after 4th year and 6th year by declining balance method.

(10 Marks)

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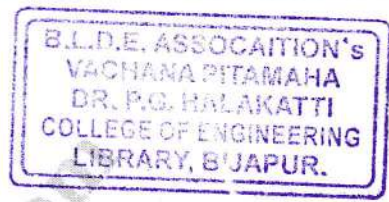
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18ME52

Fifth Semester B.E. Degree Examination, June/July 2023
Design of Machine Elements – I

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 factors to be considered for the selection for a machine component? **(06 Marks)**
   b. Explain the codes and standards used in Machine Design. **(04 Marks)**
   c. A point in a structural member subjected to a plane stress as shown in Fig.Q1(c). Determine the following :
      i) Normal and Tangential stress on a plane inclined at 45°.
      ii) Principal stresses and their direction
      iii) Maximum shear stress and the direction of the plane on which it occurs.
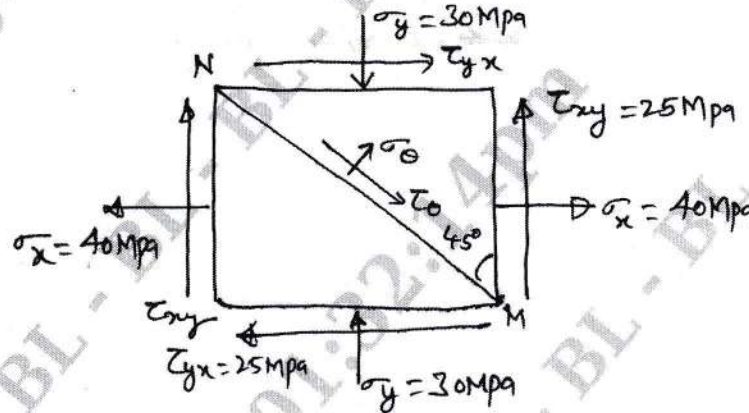

Fig.Q1(c) **(10 Marks)**

OR

2. a. Define stress concentration factor and discuss about the methods to reduce stress concentration factor. **(08 Marks)**
   b. A circular rod shaft of diameter of 50mm is subjected to load as shown in Fig.Q2(b). Determine the nature and magnitude of stresses at the critical points A and B.
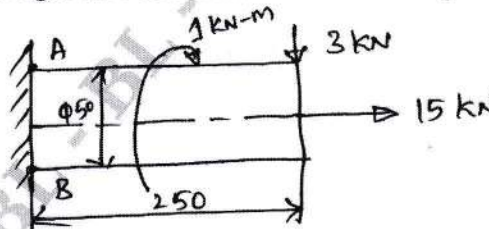

Fig.Q2(b) **(12 Marks)**

Module-2

3. a. Define Impact Stresses. Derive an expression for impact stresses in a axial bar of c/s 'A' and length 'L' due to the impact load of 'W' falling from a height 'h' from the collar.

(08 Marks)

71

b. A cantilever beam made of cold drawn carbon steel (σ_u = 550 MPa, σ_y = 470 MPa, σ_{-1} = 275 MPa) of circular cross-section is subjected to load which varies from − F to 3F. Determine the maximum load that this member can withstand for an infinite life using a factor of safety of 2. [Refer Fig.Q3(b)] **(12 Marks)**
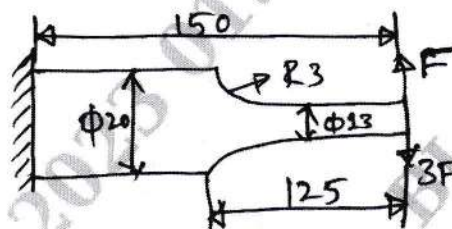

Fig.Q3(b)

OR

4 a. Define Endurance limit. Explain the effect of factors on Endurance limit. **(08 Marks)**

b. A hot rolled steel shaft is subjected to a torsional load that varies from 330 N-m (CW) to 110 Nm (CCW) as an applied bending moment at the critical section varies from +440 N-m to − 220 Nm. The shaft is of uniform cross section and no key way is present at the critical section. Determine the required shaft diameter. The material has an ultimate strength of 550 MN/m^2 and yield strength of 410 MN/m^2. Factor of safety = 1.5 size and surface correction are 0.85 and 0.62 respectively. Take the Endurance limit as half the ultimate strength. **(12 Marks)**

Module-3

5 A shaft is supported by two bearings placed 1m apart. A 500mm diameter pulley is mounted at a distance of 200mm to the right of left hand bearing and this drives a pulley directly below it with the help of belt having maximum tension of 3000N. The pulley weighs 1000N. Another pulley 300mm diameter is placed 300mm to the left of right hand bearing is driven with the help of electric motor and the belt which is placed horizontally to the right when viewed from the left bearing. This pulley weighs 500 N. The angle of contact for both the pulley is 180° and μ = 0.24. Determine suitable diameter for a solid shaft, assuming torque on one pulley is equal to torque on other pulley. Choose C15 steel (σ_y = 235.4 MPa, σ_u = 425 MPa) as the shaft material and use ASME code for the design of shaft, assume minor shock condition. **(20 Marks)**

OR

6 a. With neat sketch, explain the different types of keys. **(08 Marks)**

b. Design a flange coupling to connect the shafts of a motor and the centrifugal pump for the following specifications:

Pump output = 3000 liters/minute

Total head = 20 m

Pump speed = 600 rpm

Pump Efficiency = 70%

Select C-40 steel (σ_y = 328.6 MPa) for the shaft and C-35 steel (σ_y = 304 MPa) for bolts with factor of safety 2. Use allowable shear stress in cast iron flanges equal to 15 N/mm². **(12 Marks)**

Module-4

7 a. Design a triple riveted Lap Zig-Zag type, for a pressure vessel of 1.5m diameter. The maximum pressure inside the vessel is 1.5 MPa. The allowable stresses in tension, crushing and shear are 100, 125 and 75 MPa respectively. **(10 Marks)**

   b. A bracket is supported by means of 4 rivets of same size as shown in Fig.Q7(b). Determine the diameter of rivet, if the maximum shear stress is 140 N/mm².
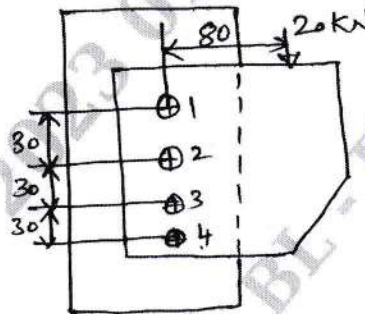

Fig.Q7(b) **(10 Marks)**

OR

8 a. A plate of 80mm wide and 10mm thick is to be welded to another plate by means of two parallel fillet welds. The plates are subjected to a load of 50 kN. Find the length of weld so that maximum stress does not exceed 50 N/mm². Consider the joint under static loading and then under dynamic loading. **(12 Marks)**

   b. A solid circular shaft 25mm in diameter is welded to a support by means of a fillet weld as shown in Fig.Q8(b). Determine the Leg dimensions of the weld, if the permissible shear stress is 95 N/mm².
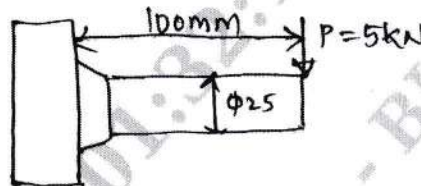
Fig.Q8(b) **(08 Marks)**

Module-5

9 a. Design a socket and spigot type cotter joint to sustain an axial load of 100 kN. The material selected for the joint has the following design stresses $\sigma_f = 100$ N/mm² , $\sigma_c = 150$ N/mm² and $\tau = 60$ N/mm². **(14 Marks)**

   b. Explain self locking and over hauling in power screws. **(06 Marks)**

OR

10 a. Derive an equation for torque required to lift the load on square threaded screw. **(10 Marks)**

   b. A split nut used with a lead screw is propelled at a speed of 5 m/min, against a load of 20 kN, along the spindle of a square thread (single start) having nominal diameter of 30mm and pitch of 6mm. The axial thrust is absorbed by collar of 100mm outside diameter and 70mm insider diameter. Determine, (i) Power required (ii) Height of bronze nut required if allowable bearing pressure is 17 MPa. (iii) Efficiency of the drive. **(10 Marks)**

* * * * *

CBCS SCHEME

18ME53

USN | | | | | | | | | |

Fifth Semester B.E. Degree Examination, June/July 2023
Dynamics of Machines

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 following terms with neat diagrams:
       (i)   Equilibrium of three force system
       (ii) Equilibrium of two force and a torque   (06 Marks)

   b. A four-link mechanism with the following dimensions is acted upon by a force 100 N ∠150° N on the link DC [Fig.Q1(b)]. AD = 500 mm, AB = 400 mm, BC = 900 mm and DC = 750 mm, DE = 350 mm. Determine the input torque T on the link AB for the static equilibrium of the mechanism for the given configuration.
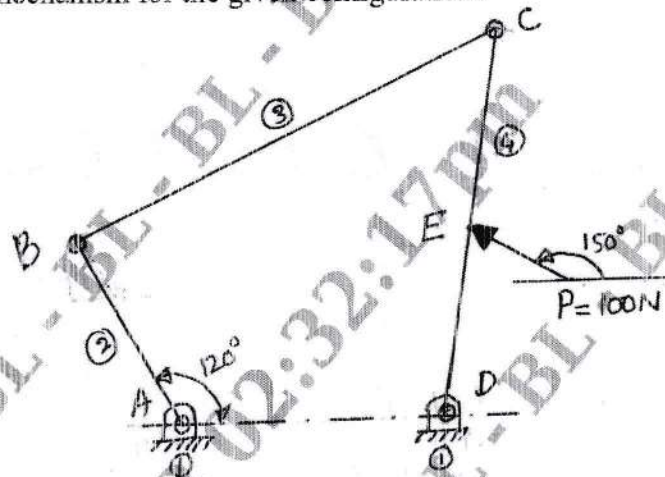
Fig.Q1(b)   (14 Marks)

OR

2 a. State and explain D'Alembert's principle.   (06 Marks)

   b. The following data relate to a horizontal reciprocating engine:
       Mass of reciprocating parts = 120 kg
       Crank length = 90 mm
       Engine speed = 900 rpm
       Connecting rod:
       Mass = 90 kg
       Length between centers = 450 mm
       Distance of center of mass from big end center = 180 mm
       Radius of gyration about an axis through center of mass = 150 mm
       Find the magnitude and the direction of the inertia torque on the crankshaft when the crank has turned 30° from inner dead center.   (14 Marks)

Module-2

3 a. What do you mean by static balancing and dynamic balancing? Explain. (06 Marks)

74

b. Four masses A, B, C and D are completely balanced. Masses C and D make angles of 90° and 195° respectively with that of mass B in the counter clockwise direction. The rotating masses have the following properties:

Mass of B = 25 kg   Radius of mass A at A plane = 150 mm
Mass of C = 40 kg   Radius of mass B = 200 mm
Mass of D = 35 kg   Radius of mass D = 180 mm

Planes B and C are 250 mm apart. Determine the :
(i)   Mass A and its angular position with that of mass B
(ii)   Positions of all the planes relative to plane of mass A.   (14 Marks)

OR

4   a. Explain complete balancing of reciprocating parts.   (05 Marks)

    b. The cranks of a foul-cylinder marine oil engine. Cranks are arranged at angular intervals of 90°. The engine speed is 70 rpm, and the reciprocating mass per cylinder is 800 kg. The inner cranks are 1 m apart and the outer are 2.6 m apart. The inner cranks are symmetrically arranged between the outer cranks. Each crank is 400 mm long.

     Determine the firing order of the cylinders for the best balance of reciprocating masses and also the magnitude of the unbalanced primary couple for that arrangement.   (15 Marks)

Module-3

5   a. Derive the expression for equilibrium speed of porter governor.   (08 Marks)

    b. Each arm of a porter governor is 250 mm long. The upper arms are pivoted to links of 40 mm from the axis of rotation. The lower arms are pivoted to links of 50 mm from the axis of rotation. Each ball has a mass of 5 kg and the central mass is 50 kg. The force of friction on the sleeve of the mechanism is 40 N. Determine the range of speed of the governor for extreme radii of rotation of 125 mm and 150 mm respectively.   (12 Marks)

OR

6   a. Explain gyroscopic couple effect on steering, pitching and rolling with respect to naval ship.   (06 Marks)

    b. What is angle of heel? Explain its importance.   (02 Marks)

    c. An aeroplane flying at 300 kmph turns towards the left and completes a quarter circle of 60 m radius. The mass of rotary engine and propeller of the plane is 450 kg with a radius of gyration of 320 mm. The engine speed is 2000 rpm clockwise when viewed from the rear. Determine the gyroscopic couple on the aircraft and state its effect.
In what way is the effect changed when the (i) aeroplane turns towards right   (ii) engine rotates clockwise when viewed from the front (nose end) and aeroplane turns left. (12 Marks)

Module-4

7   a. Explain energy method to find natural frequency of spring-mass-system.   (06 Marks)

    b. What is the effect of spring mass? Derive the expression for natural frequency of the system.   (06 Marks)

c. Determine the frequency of vibration of the system shown in Fig.Q7(c). Use the following data m = 10 kg, K_1 = 200 N/m, K_2 = 400 N/m.

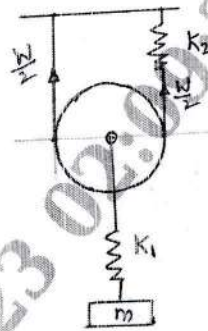Fig.Q7(c)   (08 Marks)

OR

8 a. Setup the differential equation for a spring mass damper system and obtain complete solution for the under-damped condition.   (10 Marks)

   b. Determine :
      (i)   Critical damping coefficient
      (ii) Damping factor
      (iii) Natural frequency of damped vibrations
      (iv) Logarithmic decrement
      (v)   Ratio of two consecutive amplitude of vibrating system which consists of mass of 30 kg, a spring of stiffness 1800 N/m and a damper. The damping provided is only 15% of the critical value.   (10 Marks)

Module-5

9 a. Derive the expression for the maximum displacement for forced vibration of undamped single degree freedom system.   (08 Marks)

   b. Explain vibration isolation.   (02 Marks)

   c. A machine of total mass 18 kg is mounted on springs having stiffness K = 12000 N/cm. A piston within the machine has a mass of 2 kg has a reciprocating motion with stroke 7.5 cm and speed 6000 rpm. Assuming the motion to be SHM. Determine:
      (i)   Amplitude of vibration
      (ii) Transmissibility
      (iii) Force transmitted to the ground to foundation.
      Take ξ = damping ratio = 0.2.   (10 Marks)

OR

10 a. Define critical speed and explain its types.   (05 Marks)

   b. A shaft supported freely at the ends has a mass of 120 kg placed 250 mm from one end. The shaft diameter is 40 mm. Determine the natural frequency of the transverse vibrations if the length of the shaft is 700 mm. Take E = 200 GN/m².   (05 Marks)

   c. The following data relate to a horizontal shaft held in long bearings.
      Length of the shaft = 1.2 m
      Diameter of the shaft = 14 mm
      Mass of rotor at mid point = 16 kg
      Eccentricity of center of mass of rotor from center of rotor = 0.4 mm
      E = 200 GN/m²
      Permissible stress in the shaft material = 70×10^6 N/m²
      Determine the critical speed of the shaft and the range of speed over which it is unsafe to run the shaft. Neglect mass of the shaft.   (10 Marks)

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76

USN | | | | | | | | | | | **18ME54**

Fifth Semester B.E. Degree Examination, June/July 2023
Turbo Machines

Time: 3 hrs.   Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. Use of steam tables is permitted.

Module-1

1 a. Explain the significance and use of :
   (i) Flow coefficient   (ii) Head coefficient
   (iii) Power coefficient   (iv) Specific speed of turbomachine   **(08 Marks)**

   b. A low pressure air compressor develops a pressure of 1.147 bar and temperature of 320 K if the initial pressure and temperature are 1.01 bar and 305 K respectively. Determine compressor and polytropic efficiency.   **(06 Marks)**

   c. Distinguish static and stagnation properties. Why are stagnation properties preferred to static properties for use in the analysis of turbomachine processes?   **(06 Marks)**

OR

2 a. What is a reheat factor? Prove that the overall isentropic expansion efficiency is more than the individual stage isentropic expansion efficiency.   **(08 Marks)**

   b. Define with the help of temperature entropy diagram for expansion:
   (i) Mechanical efficiency   (ii) Adiabatic efficiency
   (iii) Overall efficiency   (iv) Total-Total efficiency   **(08 Marks)**

   c. A centrifugal pump operating at the best efficiency point produces a head of 26 m and delivers 1 m^3/sec of water when rotating at 1500 rpm. Its impeller diameter is 0.5 m. If a geometrically similar pump of impeller diameter 0.8 m is operating at 1200 rpm, calculate the discharge and head.   **(04 Marks)**

Module-2

3 a. Derive an Euler's turbine equation for turbomachine. State the assumptions made in the derivation.   **(10 Marks)**

   b. A centrifugal pump of 1.5 m diameter runs at 210 rpm and pumps 1.8 m^3/sec of water. The vanes are set back with an angle 25° at exit. Assuming radial entry and velocity of flow throughout is 2.5 m/sec. Determine the power required to drive the pump. If the manometric efficiency of the pump is 65%. Find the average lift of the pump.   **(10 Marks)**

OR

4 a. Discuss the effect of discharge blade angle on degree of reaction and energy transfer in the radial flow turbo machine. Assume the radial fluid entry at the inlet.   **(10 Marks)**

   b. Air enters a rotor in an axial flow turbine with a tangential component of the absolute velocity equal to 600 m/sec in the direction of rotation. At the rotor exit the tangential component of absolute velocity is 100 m/sec in the direction opposite to that of the rotational speed. The tangential blade velocity is 250 m/sec. Evaluate total enthalpy change across the rotor, the change in total temperature across the rotor and the power developed if the mass flow rate is 10 kg/sec. Take the value of $C_p = 1.005$ kJ/kgK for air.   **(10 Marks)**

77

Module-3

5 a. What are the methods used in reducing the speed of turbine rotor? Explain any one method of reducing speed with necessary sketches. **(10 Marks)**

  b. In a reaction turbine, the blade tips are inclined at 35° and 20° in the direction of rotor. The blades are the same shape as the moving blades but reverted in the direction at certain place in the turbine. The drum is 1 m diameter and the blades are 10 cm high of this place the steam has a density of 1.042 kg/m³. If the speed of the turbine is 250 rpm and the steam passes through the blade without shock find the mass flow rate of the steam and power developed, taking absolute velocity of the steam as 32 m/sec. **(10 Marks)**

OR

6 a. Explain the working of a single stage reaction type steam turbine, with relevant diagrams. **(10 Marks)**

  b. Derive an expression for maximum blade efficiency of a single stage impulse turbine with the help of velocity triangles. **(10 Marks)**

Module-4

7 a. Explain with a neat sketch the set up of Kaplan Turbine. Where it is suited? **(10 Marks)**

  b. Determine the power given by the jet of water to the runner of a pelton wheel which is having tangential velocity as 20 m/sec. The net head on the turbine is 50 m and discharge through the jet is 0.03 m³/sec. the side clearance angle is 15° and take $C_V = 0.975$. **(10 Marks)**

OR

8 a. What is a draft tube? Why it is used in reaction turbine? Describe with sketch any two types of draft tube. **(10 Marks)**

  b. A Kaplan turbine working under a head of 20 m develops 11772 KW shaft power. The outer and hub diameter of runner is 3.5 m and 1.75 m respectively. The hydraulic and overall efficiency of the turbine are 0.88 and 0.84 respectively. If the velocity of whirl is zero at outlet. Determine: (i) Runner vane angles at inlet and outlet (ii) Speed of the turbine. **(10 Marks)**

Module-5

9 a. With a neat diagram show different heads and efficiencies that are used in the study of centrifugal pumps. **(10 Marks)**

  b. The diameter ratio of the impeller of a centrifugal compressor is 2 and the pressure ratio is 4. At a speed of 12000 rpm the flow rate is 10 m³/sec of free air. The isentropic efficiency of the compressor is 94%. The blades are radial at the outlet and the entry is radial at the inlet. The velocity of flow remains constant at 60 m/sec through the impeller. Calculate:
  (i) Power input to the machine
  (ii) The impeller diameter at inlet and outlet the suction is from the atmosphere at 100 kPa and 300 K.
  Take for air $C_p = 1.004$ kJ/kgK and $\gamma = 1.4$ **(10 Marks)**

OR

10 a. What is slip factor? Explain how does it affect the performance of the centrifugal compressor. **(06 Marks)**

  b. Explain what net positive suction head of a centrifugal pump. **(04 Marks)**

  c. The blade angles at inlet and outlet of the impeller of a centrifugal pump are 55° and 75° and the corresponding diameters are 3 cm and 6 cm respectively. The blade width at outlet is 0.75 cm. The speed is 1500 rpm. The entry of water is radial without any whirl component. The velocity of flow remains constant in the impeller. Draw the velocity triangles and calculate : (i) Specific work (ii) Flow rate (iii) Power of the machine (iv) The manometric head. The hydraulic efficiency may be taken as 0.85. **(10 Marks)**

CBCS SCHEME

USN ☐☐☐☐☐☐☐☐☐☐ 18ME55

Fifth Semester B.E. Degree Examination, June/July 2023
Fluid Power Engineering

Time: 3 hrs. Max. Marks: 100

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

Module-1

1 a. State Pascal's law. Explain with a neat sketch the structure of fluid power system. **(08 Marks)**
  b. Explain the desirable properties of hydraulic fluids. **(08 Marks)**
  c. Explain the sources of contamination of hydraulic fluids. **(04 Marks)**

OR

2 a. Explain with a neat sketches the different types of seals used in fluid power system. **(08 Marks)**
  b. With a neat circuit diagram explain suction line filter and pressure line filter. **(06 Marks)**
  c. Explain the working of air cooled heat exchanger with the aid of sketch. **(06 Marks)**

Module-2

3 a. With a neat sketch explain the working of external gear pump. Obtain an expression for volumetric displacement, theoretical flow rate and volumetric efficiency. **(10 Marks)**
  b. A pump having displacement of 140 cm³ is driven at 1440 rpm and operates against a maximum pressure of 150 bar. The volumetric efficiency is 0.9 and overall efficiency is 0.8 find (i) Pump delivery in LPM (ii) The input power required in KW (iii) The torque at the pump shaft. **(10 Marks)**

OR

4 a. Explain with a neat sketch the operation of balanced vane motor. **(08 Marks)**
  b. With a neat sketch explain Spring loaded accumulator. **(06 Marks)**
  c. A hydraulic motor has a 100 cm³ volumetric displacement. If it works at 140 bar pressure and receives fluid at a theoretical flow rate of 0.001 m³/s. Determine
  i) Speed of the motor
  ii) Theoretical torque
  iii) Theoretical Power developed **(06 Marks)**

Module-3

5 a. With a neat sketch explain the working of pressure Relief valve and pressure compensated flow control valve. **(10 Marks)**
  b. Explain the working of meter-in and meter-out circuit for controlling the speed of hydraulic cylinder. **(10 Marks)**

OR

6 a. List the various types of control valves. With a neat sketch explain the working of 3/2 sliding spool valve. **(10 Marks)**
  b. Explain with a neat circuit diagram the working of a Regenerative circuit. Obtain an expression for extending speed of the piston. **(10 Marks)**

Module-4

7   a. Explain with a neat sketch the pneumatic control system. (08 Marks)
    b. Sketch and explain the mechanism end position cushioning of pneumatic cylinder. (08 Marks)
    c. List the characteristics of compressed air. (04 Marks)

OR

8   a. Explain with the help of neat sketch Quick-Exhaust Valve. (08 Marks)
    b. Explain the working of Air Filter with the aid of neat sketch. (06 Marks)
    c. With the help of simple sketch explain pneumatic cylinder mounting methods. (06 Marks)

Module-5

9   a. Explain with a neat circuit diagram supply air throttling and exhaust air throttling. (10 Marks)
    b. Explain the functions of 'OR' and 'AND' gates with Shuttle Valve and twin pressure valve respectively. (10 Marks)

OR

10 a. Explain the controlling of pneumatic cylinders in a sequence as $A^+ B^+ B^- A^-$ by cascading method. (12 Marks)
    b. Explain Electro-Pneumatic Control of single acting cylinder with a suitable circuit. (08 Marks)

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18ME56

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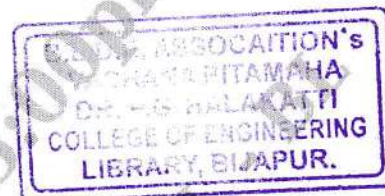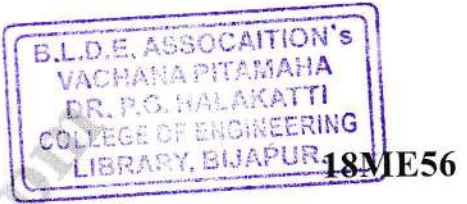
Fifth Semester B.E. Degree Examination, June/July 2023
Operation Management

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 terms :
         i) Production   ii) Production System.   **(04 Marks)**
    b.   What is Decision Making? Is decision making a Science? Justify. Explain steps involved in
         Decision Making.   **(10 Marks)**
    c.   Explain the functions of any Business Organization.   **(06 Marks)**

OR

2   a.   Explain the distinguishing characteristics of Products versus Services.   **(06 Marks)**
    b.   Explain factors affecting Productivity.   **(06 Marks)**
    c.   A Company manufactures and sells a product at Rs 320 each. The fixed cost was
         Rs 3,00,000 and the variables cost per product was Rs 20. What is the contribution per
         product? What is the Break – even Quantity?   **(08 Marks)**

Module-2

3   a.   What is Forecasting? Show the classification of Forecasting.   **(06 Marks)**
    b.   The demand of a product of a certain company is shown below :
         Using a time period value of n = 3 and use simple Moving Average method, determine the
         following :
         i)   Forecasts for each period.
         ii) Deviations, Mean Deviation.
         iii) Absolute Deviation, Mean Absolute Deviation.

Week :	1	2	3	4	5	6	7
Demand / units	180	190	210	195	205	215	210

                                                                              (14 Marks)

OR

4   a.   What is Forecasting? Explain the steps in Forecasting process.   **(08 Marks)**
    b.   A firm believes that its annual profit depends on its expenditures for research. The following
         datas are given. Estimate the profit when expenditure is 6 units.

Year :	1989	1990	1991	1992	1993	1994
Expenditure :	2	3	5	4	11	5
Annual profit :	20	25	34	30	40	31

                                                                              (12 Marks)

Module-3

5   a.   Define the terms :
         i) Design capacity   ii) System capacity   iii) System efficiency.   **(06 Marks)**
    b.   Explain the Long term and Short term strategies of Capacity planning.   **(08 Marks)**

81

1 of 2

c. A plastics firm has four work centres A, B, C, D in series with individual capacities (units / day) and actual output as shown below :
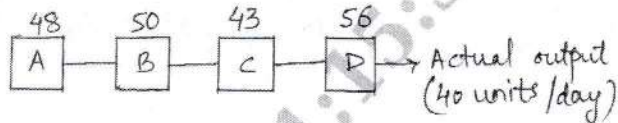
Determine : i) System Capacity   ii) System Efficiency.   **(06 Marks)**

OR

6 a. What is the need and importance of Factory Location Decision?   **(10 Marks)**
  b. Explain the systematic process in finding a good Location.   **(10 Marks)**

Module-4

7 a. Explain the flow chart of Aggregate planning and Master Production Schedule.   **(10 Marks)**
  b. Define Master Scheduling. Explain.   **(05 Marks)**
  c. A Chemical Company has developed a forecast as shown below. It uses a K factor of 0.8. if the actual demand is 11500 units in April, what modified scheduled quantity should be scheduled for June.

Month	Forecaste	Actual
April	12000	11500
May	16000	-
June	14000	-

(05 Marks)

OR

8 a. Explain the strategies of Aggregate Planning.   **(10 Marks)**
  b. Explain Master Scheduling Methods.   **(10 Marks)**

Module-5

9 a. What is MRP? Explain the structure of MRP.   **(10 Marks)**
  b. The projected requirements of a Company are given below. The Economic Order Quantity (EOQ) is 300 units and the Lead time is 2 weeks. The material available in hand is 100 units. Prepare a detail Materials requirement plant.

Week :	1	2	3	4	5	6	7	8
Required :	80	-	-	120	-	120	-	100

(10 Marks)

OR

10 a. Explain the difference between Purchasing , Procurement and Supply Chain Management.   **(10 Marks)**
   b. What is a Vendor? Explain the process of Vendor development.   **(10 Marks)**

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82

CBCS SCHEME

18CIV59

USN ☐☐☐☐☐☐☐☐☐☐

Fifth Semester B.E Degree Examination, June/July 2023
Environmental Studies
(COMMON TO ALL BRANCHES)

Time: 2 hrs.]   [Max. Marks: 100

INSTRUCTIONS TO THE CANDIDATES

1. Answer all the hundred 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.

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1. How many parts are there in the forest ecosystem?
   a) One   b) Two   c) Three   d) Four

2. On which factor forest type is mainly dependent
   a) Abiotic   b) Size of forest
   c) Shape of Trees   d) Production from the trees

3. The forest cover in India has recently increased due to
   a) Increase in natural forest growth
   b) Increase in net sown area
   c) Plantation by different agencies
   d) None of the above

4. What is not entirely correct about desert?
   a) It is dry and hot   b) Waterless
   c) Without shelter   d) All of these

5. Who have learnt to live under very hot and dry conditions
   a) People   b) Plants   c) Animals   d) All of these

6. The term wet land implies
   a) Land covers by rain water only
   b) Slow moving water covered wet ground
   c) Water logged wet ground
   d) Fast moving water covered wet ground

7. World Wetland day celebrated every year on _____ February
   a) 2nd   b) 3rd   c) 4th   d) 15th

83

8. World's most saltiest sea is
   a) Mediterranean Sea   b) Dead Sea   c) Callibben Sea   d) Black Sea

9. Atmosphere contains 79 percent Nitrogen and 21 percent Oxygen by
   a) Volume   b) Weight   c) Density   d) All of these

10. In complex ecosystem the degree of species diversity is
    a) Poor   b) High   c) Medium   d) None

11. The organisms who directly feed on producers are called
    a) Herbivores   b) Carnivores   c) Decomposers   d) Sprophytes

12. Abiotic component includes
    a) Soil   b) Water   c) Temperature   d) All of these

13. Which of the following is the climatic factor
    a) Pressure   b) Humidity   c) Temperature   d) All of these

14. The basic requirements of human beings are provided by
    a) Industrialization   b) Agriculture   c) Nature   d) Urbonization

15. Which atmospheric sphere is closest to the earth surface?
    a) Troposphere   b) Stratosphere   c) Mesosphere   d) Exosphere

16. A food web consists of
    a) A portion of a food chain
    b) An organism position in a food chain
    c) Interlocking food chains
    d) A set of similar consumers

17. The pyramid of energy is
    a) Always upright
    b) Always inverted
    c) Both uplight and inverted
    d) None of these

18. Which is the most stable ecosystem
    a) Mountain   b) Desert   c) Forest   d) Ocean

19. 'Earth Day' is held every year on
    a) June 5th   b) November 23rd   c) April 22nd   d) Jan 10th

20. Which of the following is absorbed by green plants from the atmosphere?
    a) Carbon dioxide   b) Water   c) Nutrients   d) All of these

21. The most commonly used chemicals in the artificial cloud seeding
    a) Silver iodide   b) Sodium chloride   c) Dry ice   d) All of these

22. Bhopal disaster is a kind of _____
    a) Natural disaster   b) Manmade disaster   c) None of (a) & (b)   d) Other

23. National disaster management is headed by
    a) Prime minister
    b) President of India
    c) Governor of states
    d) Chief minister of states.

24. Disaster management includes
   a) Mitigation   b) Reconstruction   c) Rehabilitation   d) All of these

25. Floods can be prevented by _____
   a) Attorestation   b) Cutting the forest
   c) Tilling the land   d) Removing the top soil

26. Which of the following is not a type of primary source
   a) Crude oil   b) Coal   c) Hydrogen energy d) Sunlight

27. Which of these energy resources are widely used in industries?
   a) Coal and Gasoline   b) Wood   c) Biogas   d) Crop residue

28. What does OTEC stands for?
   a) Ocean thermal energy cultivation
   b) Ocean thermal energy conversion
   c) Ocean techno energy conversation
   d) Ocean thermal energy consumption

29. What is the basic requirement for hydro electric power station?
   a) Reservoir   b) Turbine   c) Power house   d) Penstock

30. Photovoltaic cell converts solar energy into
   a) Heat energy   b) Electrical energy   c) Mechanical energy d) Chemical energy

31. Which of the following is non-renewable resource?
   a) Coal   b) Forests   c) Water   d) Wildlife

32. Both power and manure is provided by :
   a) Nuclear plants   b) Thermal plants   c) Biogas plants   d) Hydroelectric plant

33. At what range of speed is the electricity from the wind turbine is generated
   a) 100 – 125 Mph   b) 450 – 600 Mph   c) 200 – 250 Mph   d) 30 – 35 Mph

34. What is used to turn wind energy into electrical energy
   a) Turbine   b) Generator   c) Yaw motor   d) Blades

35. What type of energy is wind energy?
   a) Renewable   b) Non-Renewable   c) Conventional   d) Commercial

36. How is OTEC caused?
   a) By wind energy   b) By geothermal energy
   c) By solar energy   d) By gravitational force

37. Series of parallel combination of the solar cell is known as _____
   a) Solar array   b) Solar light   c) Solar sight   d) Solar eye

38. Materials used for making solar cell is _____
   a) Silicon   b) Carbon   c) Sodium   d) Magnesium

39. Quarries are generally
   a) Open pits   b) Surface coal mines
   c) Underground mines   d) Explosive mines

3 of 8

85

40. When the minerals are located to deep in the ground, the method used for mining is
    a) Open pit method   b) Quarries   c) Surface mining   d) Sub surface mining

41. Major pollution causing agent is
    a) Man
    c) Hydrocarbon gases
    b) Animals
    d) None of these

42. The result of ozone hole is
    a) Acid rain   b) UV radiations   c) Global warming   d) Green house effect

43. Which of the following causes out break of jaundice
    a) Air pollution   b) Water pollution   c) Thermal pollution   d) Soil pollution

44. Minamata disease caused by pollution of water by
    a) Mercury
    c) Tin
    b) Lead
    d) Methyl ISD Cyanate

45. Noise is measured using sound meter and the unit is
    a) Hertz   b) Decibel   c) Joule   d) Sound

46. Air pollution causes
    a) Global warming
    c) Soil erosion
    b) Respiratory problems
    d) None of these

47. Intake of lead may primarily cause damage of the _____
    a) Brain   b) Liver   c) Lung   d) Kidney

48. According to WHO maximum permissible level of chlorides in drinking water is _____
    a) 100 mg/L   b) 600mg/L   c) 800mg/L   d) 200mg/L

49. The main source of water pollution is _____
    a) Sewage water
    c) Acid rain
    b) Industrial pollutants
    d) None of these

50. What is the health effects of excess fluoride in drinking water
    a) Fluoros's   b) Toothaches   c) Lung disease   d) Brain problem

51. Bacteria and micro organisms present in water will cause _____ in human and animals
    a) Indigestion   b) Intestinal tract   c) Brain tumor   d) Cancer

52. Why it is difficult to recycle plastics?
    a) It is very hard
    b) It comes in different sizes
    c) It is adhesive
    d) It contains different types of polymer resins

53. The disposable wastes contain
    a) Solids   b) Slurries   c) Liquids   d) All of these

54. Identify the following ones which can be recycled many times
    a) Plastic   b) Wood   c) Aluminum   d) Organic materials

55. Noise pollution limits at residential area
    a) 80 dB   b) 45 dB   c) 90dB   d) 120dB

56. Which of the following make e-waste hazardous in nature
    a) Glass   b) Plastic   c) Lead   d) Iron

57. What is the hazardous pollutant released form LED's?
    a) Barium   b) Arsenic   c) Cobalt   d) Cadmium

58. What is the hazardous pollutant released form batteries?
    a) Arsenic   b) Cadmium   c) Copper   d) Cobalt

59. What proportion of health care waste is hazardous waste
    a) 25%   b) 15%   c) 50%   d) 80%

60. What is the hazardous waste released from telephones
    a) Barium   b) Copper   c) Lithium   d) Lead

61. Which of the following contains most water
    a) Atmosphere   b) Biosphere   c) Ground water   d) Lakes and Rivers

62. Hard water contains large amount of _____
    a) Lead   b) Sodium   c) Calcium   d) Silicon

63. Water that is good enough to drink is called _____
    a) Potable water   b) Ground water   c) Surface water   d) Artesian water

64. The pH value of acid rain water is
    a) 5.7   b) 7.0   c) 8.5   d) 7.5

65. The primary cause of acid rain around the world is _____
    a) CFC   b) SO_2 c) CO   d) O_3

66. Acid rain can be controlled by
    a) Reducing SO_2 and NO_2 emissions
    b) Reducing oxygen emissions
    c) Increasing number of lakes
    d) Increasing the forest cover

67 The effect of acid rain
    a) Reduces soil fertility
    b) Increases atmospheric temperature
    c) Causing respiratory problem
    d) Skin cancer

68 Major compound responsible for the destruction of stratospheric ozone layer is
    a) Oxygen   b) CFC   c) CO_2 d) Methane

69. Ozone layer thickness is measured in
    a) PPM   b) PPB   c) Decibles   d) Dobson units

70. Normal average thickness of stratospheric ozone layer across the globe is around
    a) 5 PPM   b) 300 DU   c) 400 DU   d) 500 DU

71. Chloro Fluro Carbon's (CFC) are
    a) Non-toxic   b) Non – Flammable
    c) Non Carcinogenic   d) All of these

72. Breathing radon over time causes
    a) Lung cancer b) Oral cancer c) Skin cancer d) All of these

73. Radon gas is
    a) Inert b) Colorless c) Odorless d) All of these

74. Ozone depletion causes
    a) Snow blindness b) Photochemical smog
    c) Acid rain d) Vomiting

75. World ozone day is observed on
    a) November 16 b) October 16 c) Jan 16 d) September 16

76. A great way to reduce acid rain is
    a) Use of solar power
    b) Use of wind power
    c) User of hydropower
    d) All of these

77. Ozone layer was first discovered over
    a) Arctic
    c) Tropical Region b) Antarctical
    d) Africa

78. Animal husbandry results in
    a) Global warming b) Acid rain
    c) Ozone depletion d) None of these

79. Formation of ozone layer is explained by
    a) Rosenmund reaction
    b) Henderson's reaction
    c) Chapman's reaction
    d) Perkin's reaction

80. The main cause of acid rain is
    a) Soil pollution b) Water pollution c) Air pollution d) All of these

81. Remote sensing technique makes use of properties of _____
    a) Electric waves b) Sound waves
    c) Electromagnetic waves d) Wind waves

82. The attitude distance of a geostationary satellite from earth is about
    a) 26,000 km b) 30,000 km c) 36000 km d) 44000 km

83. The changes in the reflectivity/emissivity with time is called
    a) Spectral variation b) Spatial variation
    c) Temporal variation d) None of these

84. Which one of the following helps to find objects on the earth surface
    a) Atmospheric window b) Signature
    c) Radiometric error d) None of these

85. Orbital radius of GPS satellites is approximately
    a) 15000km b) 26600km c) 18400km d) 36100km

88

86. GIS stands for
    a) Geographic Information System
    b) Generic Information System
    c) Geological Information System
    d) Geographic Information Sharing

87. GIS deals with what kind and data
    a) Numeric data   b) Binary data   c) Spatial data   d) Complex data

88. Among the following _____ is example of hardware
    a) Arc GIS   b) Auto CAD   c) Digitization   d) Mouse

89. Among the following which do not come under components of GIS?
    a) Hardware   b) Software   c) Compiler   d) Data

90. The relation between velocity, wave length and frequency is
    a) $\lambda = cf$ b) $\lambda = c/f$ c) $\lambda = c^2 f$ d) $\lambda = cf^2$

91. A short – term EIA (Environmental Impact Assessment) has a time period of
    a) 2 – 5 years   b) 10 – 15 years   c) 5 – 10 years   d) 5 – 7 years

92. EIA commenced in the year
    a) 1960's   b) 1890's   c) 1880's   d) 1950's

93. How many strategies are there in EIA
    a) 5   b) 3   c) 2   d) 4

94. Which is the first Country to pass the Amendment in the Parliament to safeguard the environment?
    a) India   b) Brazil   c) China   d) Denmark

95. ISO 14000 standards are for the
    a) Quality Management System
    b) Environmental Management System
    c) Administration
    d) Supply Chain

96. Who among the following is the most celebrated environmental activist in contemporary India?
    a) Anna Hazare
    b) Medha Patkar
    c) Vasundhara Raje
    d) Arvind Kejrival

97. What is the full form of NGO?
    a) Non – Governmental Organization
    b) No Governance Organization
    c) Non-Governance Organization
    d) Null Governmental Organization
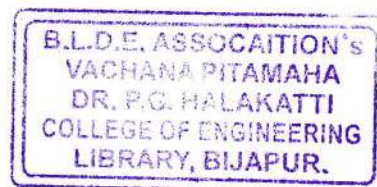
98. When did Green peace founded
   a) 1965   b) 1967   c) 1968   d) 1971

99. When did Wild Protection Act included in the Constitution of India.
   a) 1980   b) 1972   c) 1920   d) 1992

100. When did World Nature Organization (WNO) be established?
   a) 2000   b) 2001   c) 2010   d) 2014

* * * * *

CBCS SCHEME

18ME61

USN | | | | | | | | | |

Sixth Semester B.E. Degree Examination, June/July 2023
Finite Element Methods

Time: 3 hrs.   Max. Marks: 100

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

Module-1

1   a. Define FEM. List the advantages and disadvantages of FEM.   (10 Marks)
    b. List and explain steps in FEM.   (10 Marks)

OR

2   a. Explain simplex, complex and multiplex elements.   (06 Marks)
    b. A cantilever beam of span 'L' is subjected to a point load at its free end as shown in Fig.Q2(b). Derive an equation for the deflection at free end by using RR method. Assume polynomial displacement function.
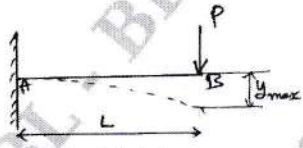
Fig.Q2(b)   (14 Marks)

Module-2

3   a. Derive the element stiffness matrix of 1D bar element.   (08 Marks)
    b. Using penalty method of handling boundary condition, determine the nodal displacement, stress in each element and support reaction in the bar shown due to applied load in Fig.Q3(b). P = 100 kN.
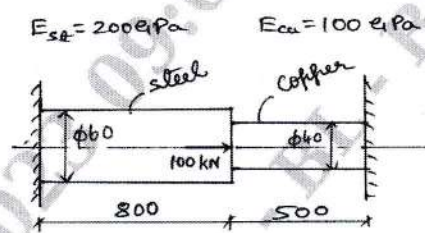
Fig.Q3(b)   (12 Marks)

OR

4   a. List the assumptions made in Truss.   (04 Marks)
    b. A 4 bar truss element is shown in Fig.Q4(b). Determine the following:
        i) Nodal displacement   ii) Stress in each element   iii) Reaction at supports.
        Area of each truss element = 100 mm^2 ; E = 2×10^5 N/mm^2.
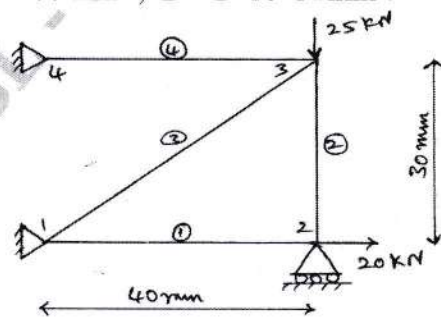
Fig.Q4(b)   (16 Marks)

91

Module-3

5 a. Derive the Hermite shape function of a Beam element. **(08 Marks)**
   b. For the beam shown in Fig.Q5(b), determine the displacement at node 2 and internal loads. Take E = 210 GPa, b = 0.2 m ; h = 0.4 m.
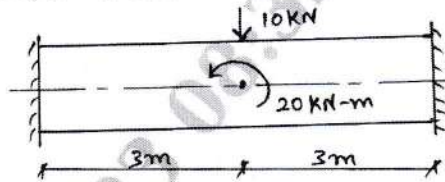

Fig.Q5(b) **(12 Marks)**

OR

6 a. Derive the stiffness matrix for the torsion of shafts. **(08 Marks)**
   b. A solid stepped bar of circular cross section shown in Fig.Q6(b) is subjected to a torque of 1 kN-m at its free end and a torque of 3 kN-m at its change in c/s. Determine the angle of twist and shear stresses in the bar. Take $E = 2\times10^5$ N/mm^2 and $G = 7\times10^4$ N/mm^2.
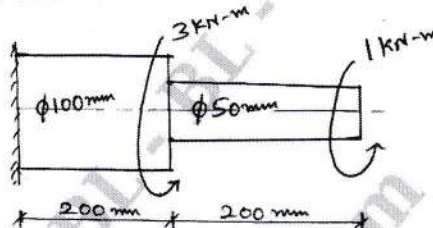
Fig.Q6(b) **(12 Marks)**

Module-4

7 a. Derive the governing differential equation for 1-D heat conduction. **(06 Marks)**
   b. Determine the temperature distribution in the composite wall using 1D heat elements, use penalty approach of handling BC's. Refer Fig.Q7(b).
   Given :
   k_1 = 20 W/m °C
   k_2 = 30 W/m °C
   k_3 = 55 W/m °C
   h = 30 W/m^2 C
   T_∞ = 900°C
   A = Unit area
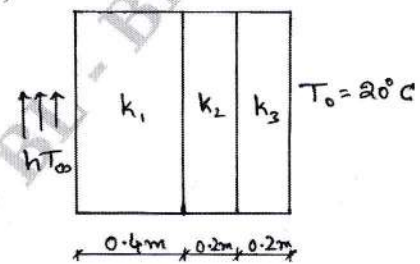
Fig.Q7(b) **(14 Marks)**

OR

8 a. Derive the element stiffness matrix of 1-D fluid flow element. **(06 Marks)**
   b. For the smooth pipe of variable cross-section shown in Fig.Q8(b), determine the potential at the junction, the velocities in each section of pipe and the volumetric flow rate. The potential at left end is P_1 = 10 m^2/s and at right end is P_4 = 1 m^2/s. For the fluid flow through a smooth pipe k_x = 1.

92

18ME61
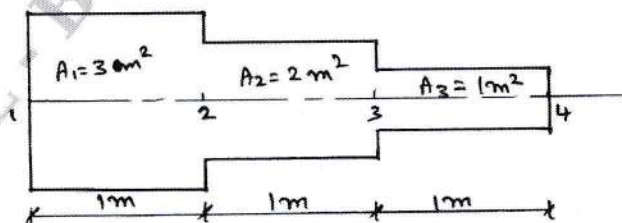
Module-5

9 a. Derive the element stiffness matrix of a triangular axisymmetric element using potential energy approach. **(06 Marks)**

   b. For the element of an axisymmetric body rotating with constant angular velocity $w = 1000$ rev/min as shown in Fig.Q9(b). Determine the body force vector. Include the weight of the material, where specific density is 7850 kg/m^3.
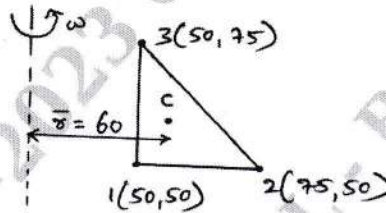

Fig.Q9(b) **(14 Marks)**

OR

10 a. Derive an expression of element mass matrices of
   (i) 1-D bar element
   (ii) Truss element **(10 Marks)**

   b. Evaluate eigen value and eigen vector of longitudinal vibration of the constrained uniform circular bar shown in Fig.Q10(b). Take minimum two elements. Take E = 210 GPa and $\rho = 7860$ kg/m^3.

Fig.Q10(b) **(10 Marks)**

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93
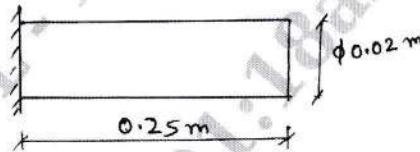
USN |_|_|_|_|_|_|_|_|_|_| **18ME62**

Sixth Semester B.E. Degree Examination, June/July 2023
Design of Machine Elements – II

Time: 3 hrs.

Max. Marks: 100

Note:1. Answer any FIVE full questions, choosing ONE full question from each module.
2. Using design data hand book is permitted.
3. Assume missing data suitably.

Module-1

1 a. Discuss about the following terms :
   - (i) Active coils
   - (ii) Deflection
   - (iii) Solid length
   - (iv) Free length
   - (v) Resilience   **(05 Marks)**

   b. Derive an expression for energy stored in a spring.   **(05 Marks)**

   c. Design a helical compression spring to carry a load of 500 N with a deflection of 20 mm. The allowable shear stress in the spring material is 350 MN/m^2 and the modulus of rigidity is 82.7×10^3 MN/m^2. The spring index is 6.   **(10 Marks)**

OR

2 a. A leather belt 125 mm wide and 6 mm thickness transmits power from a pulley 750 mm diameter which runs at 500 rpm. The angle of lap is 150° and the coefficients of friction between the belt and the pulley is 0.3. If the belt density is 1000 kg/m^3 and the stress in the belt is not to exceed 2.75 N/mm^2, find the power that can be transmitted by the belt. Also find the initial tension in the belt.   **(10 Marks)**

   b. An oil well has to be drilled to a depth of 900 mm using 100 drill pipe. Assume 200 N for every 15 m length of pipe. The rope sheaves are of 80 mm diameter and acceleration is 2.5 m/s^2. Determine the size of 6×37 wire rope for lifting the string of pipes using a FOS as 3 and ultimate stress as 1800 MPa.   **(10 Marks)**

Module-2

3 Design a pair of spur gear to transmit 27 kW for an oil pump with the gear ratio of 3 : 1, the rpm of the pinion is 1200, the centre distance is 400 mm, and the gears are to be forged steel untreated with $14\frac{1}{2}°$ FDI. Check the design for dynamic and wear condition.   **(20 Marks)**

OR

4 A pair of helical gears are used to transmit 15 kW. The teeth are 20° full depth in normal plane and have a helix angle of 30°. The pinion has 24 teeth and operates at 1000 rpm. The velocity ratio is 5 to 1. The pinion is made of cast steel $[\sigma_d = 50\,\text{MPa}]$ and the gear is of bronze $[\sigma_d = 40\,\text{MPa}]$. The pinion material is hardened to 200 BHN. Design the gear pair.   **(20 Marks)**

94

Module-3

5. A pair of straight tooth bevel gear at right angle is to transmit 5 kW at 1200 rpm of the pinion. The diameter of the pinion is 80 mm and the velocity ratio is 3.5 to 1. The tooth form is $14\frac{1}{2}^{\circ}$ composite type. Both pinion and gear are made of CI $\left[\sigma_d = 55 \text{ N/mm}^2\right]$. Determine the face width and the required module from the stand point of strength using Lewis equation and check for design from the stand point of dynamic load and wear load.

(20 Marks)

OR

6. Design a worm gear to transmit 2 kW at 1000 rpm, speed ratio is 20 and centre distance is 200 mm.

(20 Marks)

Module-4

7. a. A cone clutch with a face angle of 14° has to transmit 286 N-m of torque at a speed of 600 rev/min. The larger diameter of the clutch is 250 mm, face width is 60 mm and co-efficient of friction is 0.18. Determine (i) Axial force to transmit the torque (ii) Average normal pressure (iii) Maximum normal pressure. Assume uniform wear condition.

(10 Marks)

   b. A single plate friction clutch of both sides effective has 0.3 m outer diameter and 0.16 m inner diameter. The coefficient of friction is 0.2 and it runs at 1000 rpm. Find the power transmitted for uniform wear and uniform pressure distribution cases if the allowable maximum pressure is 0.08 MPa.

(10 Marks)

OR

8. a. Fig. Q8 (a) shows a CI brake shoe. The coefficient of friction is 0.30. The breaking torsional moment is to be 346 N. Determine
   (i) The force P, for anti-clock wise rotation.
   (ii) The force P, for clockwise direction.
   (iii) Where must the pivot be placed to make the brake self energizing with the counter clockwise direction.
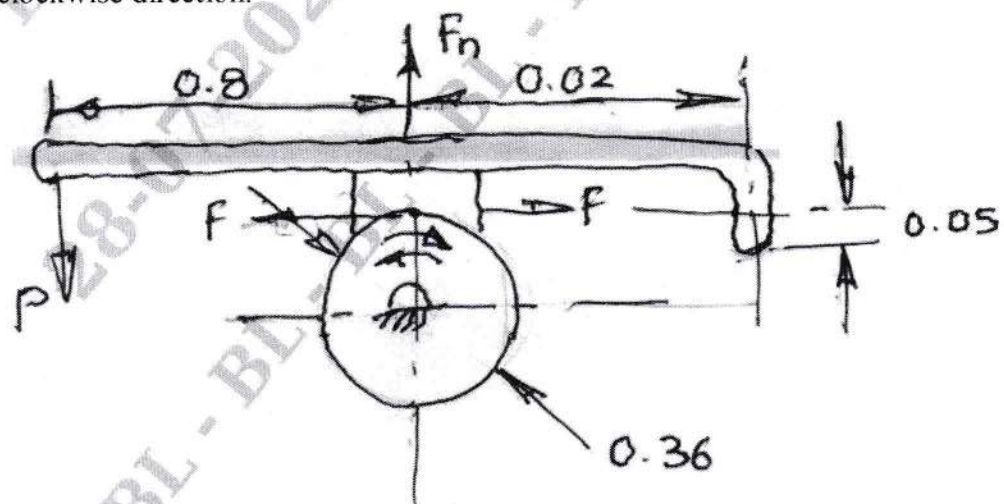

Fig. Q8 (a)

(10 Marks)

b. In a simple band break, the length of the lever is 440 mm, the tight end of the hand is attached to the fulcrum of the lever and the slack end to a pin 50 mm from the fulcrum. The diameter of the break drum is 1 mm and arc of contact is 300°, the co-efficient of friction between the band and the drum is 0.35. the break drum is attached to a hoisting drum of diameters 0.65 m that sustains a load of 20 kN (Fig. Q8(b)),
   (i) Force required at the end of lever to support the load.
   (ii) Width of steel band if the tensile stress is limited to 50 N/mm^2.
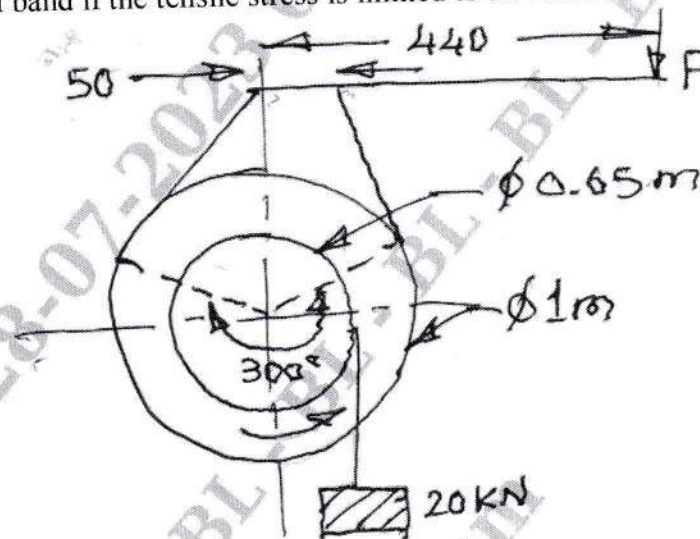
Fig. Q8 (b)

(10 Marks)

Module-5

9 a. Derive Petroff's equation for lightly loaded bearing. **(12 Marks)**

   b. For a full journal bearing has the following specification : Shaft diameter 45 mm, bearing length 66 mm, Clearance ratio 0.0015, Speed 2800 rpm, Load 800 N and absolute viscosity 8.27×10^{-3} Pa-S. Determine (a) frictional torque (b) Co-efficient of friction (c) Power loss.
   (08 Marks)

OR

10 a. A full journal bearing of 50 mm diameter and 100 mm long has a bearing pressure of 1.4 N/mm^2. The speed of journal is 900 rpm and the ratio of journal diameter to the diametrical clearance is 1000. The bearing is lubricated with oil whose absolute viscosity at the operating temperature of 75°C may be taken as 0.011 kg/m. The room temperature is 35°C. Determine :
   (i) The amount of artificial cooling required.
   (ii) The mass of lubricating oil required, if the difference between outlet and inlet temperature of the oil is 10°C.
   Take specific heat of 1850 J/kg°K. **(10 Marks)**

   b. A bearing for an axial flow compressor is to carry a radial load of 4905 N and thrust load of 2452 N. The service imposes light shock and the bearing is used for 40 hours/week for 5 years. The speed of the shaft is 300 rpm and diameter of the shaft is 60 mm. Select a suitable bearing.
   (10 Marks)

* * * * *

96

CBCS SCHEME

USN | | | | | | | | | | **18ME63**

Sixth Semester B.E. Degree Examination, June/July 2023
Heat Transfer

Time: 3 hrs.   Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. Use of Thermodynamic and Heat Transfer data hand book is permitted.
3. Any missing data can be suitably assumed.

Module-1

1 a. With usual notations, starting from 3-dimesional conduction equation, derive one dimensional equation in rectangular coordinates. **(10 Marks)**
   b. Explain the different boundary conditions as applicable to heat transfer analysis. **(10 Marks)**

OR

2 a. What is critical thickness of insulation? Derive an expression for critical radius of insulation interms of thermal conductivity and HTC 'h'. **(10 Marks)**
   b. A furnace wall is made up of inside silica brick (K = 1.856 W/m-K) and outside magnesia brick (K = 5.568 W/m-K) each 10 mm thick. If inner and outer surface temperature of wall are 820°C and 120°C. Find the heat flow rate through the plane Wall/m². Take the contact resistance of 1.722×10^{-3} m²-K/W. Also find the interface temperature. **(10 Marks)**

Module-2

3 a. With usual notations, derive an expression for temperature distribution for infinite Fin. State the assumptions made. **(10 Marks)**
   b. Find the amount of heat transfer through iron fin of thickness 5 mm, height 50 mm and width 100 cm. Take atmospheric temperature as 28°C and K = 50 W/m-K. The HTC = 10 W/m²-K the temperature difference at the base of the fin = 80°C. Estimate the efficiency of the fin. **(10 Marks)**

OR

4 a. With usual notations derive an expression for temperature distribution through a body for lumped parameter analysis in terms of Biot number and Fourier number. **(10 Marks)**
   b. Mild Steel Sphere of 15 mm dia initially at 625°C is exposed to current of air at 25°C with HTC h = 120 W/m²-K. Calculate:
      (i)   Time required to cool the sphere to 100°C
      (ii) Initial rate of cooling in °C/sec.
      (iii) Total energy removed for one minute. The thermophysical properties for MS are K = 43 W/m-K, C = 474 W/m-K, ρ = 7850 kg/m³ and α = 0.045 m²/sec. **(10 Marks)**

Module-3

5 a. Write a note on spectral and total emissive power of a body. **(08 Marks)**
   b. Write a short note on the concept of black body and grey body. **(04 Marks)**
   c. The average solar radiation flux on the earth's atmosphere is 1353 W/m². Calculate the temperature of sun (a black body) having diameter 1.392×10^6 km and has a mean distance of 1.496×10^8 km from the earth's atmosphere. State any assumption made. **(08 Marks)**

97

OR

6 a. Explain Wein's displacement law, Kirchoff's law and Max Plank's law. **(10 Marks)**

  b. Two large parallel planes with emissivity of 0.6 are at 900 K and 300 K. A radiation shield with one side polished and having emissivity of 0.05, while the emissivity of other side is 0.4 is proposed to used. Which side of the shield to face the hotter plane, if the temperature of shield is to kept minimum? Comment on your answer. **(10 Marks)**

Module-4

7 a. Explain the concept of development of boundary layer over a flat plate with different zones. **(10 Marks)**

  b. Atmospheric air at 2°C and free stream velocity of 20 m/s flows over 1.5 m long flat plate maintained at uniform temperature of 88°C. Calculate:
  (i) The average HTC 'h' over the region of laminar boundary layer.
  (ii) Average H.T.C. (Heat Transfer Coefficient) for entire length of plate 1.5 m.
  (iii) Total Heat Transfer Rate. Take critical Reynolds number $Re_c = 2 \times 10^5$. **(10 Marks)**

OR

8 a. Explain the significance of Reynolds number, Prandtl Number, Nusselt number and Grasshof number with equations. **(10 Marks)**

  b. Calculate the total heat loss from a human body, assuming as vertical cylinder, 30 cm in dia and 175 cm in height stand in still air at 13°C. Take the skin temperature as 37°C and emissivity as 0.4. **(10 Marks)**

Module-5

9 a. Define heat exchanger and classify them. **(04 Marks)**

  b. Derive an expression for Lag Mean Temperature Difference (LMTD) for counter flow heat exchanger. State the assumptions made. **(08 Marks)**

  c. A heat exchanger is required to cool 55000 kg/hr of alcohol from 66°C to 40°C using 44,000 kg/hr of water entering at 5°C. Calculate:
  (i) Exit temperature of water
  (ii) Heat transfer
  (iii) Surface area required for parallel flow and counter flow type heat exchanger design and comment on the results overall HTC U = 580 W/m^2-K, $C_{p(alcohol)}$ = 3760 J/kg-K, $C_{p(water)}$ = 4180 J/kg-K. **(08 Marks)**

OR

10 a. Define film wise and drop wise condensation process. **(04 Marks)**

  b. With a neat sketch, explain the modes of pool boiling. **(08 Marks)**

  c. Steam at 0.065 bar condenser on a vertical plate 0.6 m square. If the surface temperature of the plate is maintained at 15°C, estimate the rate of condensate. The properties of condensate at mean temperature 26.4°C are, ρ = 1000 kg/m^3, μ = 864 $\times$ 10^{-6} N-S/m^2, K = 0.913 W/m-K., $h_{fg(latent\ heat)}$ = 2412 $\times$ 10^3 J/kg-K. **(08 Marks)**

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CBCS SCHEME

18ME641

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Sixth Semester B.E. Degree Examination, June/July 2023
Non - Traditional Machining

Time: 3 hrs.   Max. Marks: 100

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

Module-1

1 a. Define Non-traditional Machining. What are the need of NTM? Explain briefly. **(08 Marks)**
   b. What are difference between Conventional and Non – conventional Machining? **(06 Marks)**
   c. List and explain the various factors to be considered for selection of NTM process.
   (06 Marks)

OR

2 a. Give classification of NTM process. **(08 Marks)**
   b. List applications of NTM. **(06 Marks)**
   c. List any 3 advantages and limitations of NTM. **(06 Marks)**

Module-2

3 a. With neat sketch, explain USM process. **(10 Marks)**
   b. Explain with neat diagram, process parameters in USM. **(10 Marks)**

OR

4 a. Explain with neat sketch, working principle of Abrasive Jet Machining and also give advantages of AJM. **(10 Marks)**
   b. With the neat sketch, explain Water Jet Machining process and also give advantages and limitations of WJM. **(10 Marks)**

Module-3

5 a. With neat sketch, explain the working of ECM process. **(10 Marks)**
   b. With neat sketch, explain ECG. Also give the advantages and limitations of ECG. **(10 Marks)**

OR

6 a. Explain the following in Chemical Machining Process :
       i) Maskants   ii) Etchants. **(08 Marks)**
   b. List out advantages and applications of Chemical Machining. **(06 Marks)**
   c. Write a short note on Chemical Blanking. **(06 Marks)**

Module-4

7 a. Explain with neat sketch the mechanism of metal removal in Electric discharge machining and also give applications. **(10 Marks)**
   b. Explain Die Electric Medium, its functions and desirable properties in EDM process.
   (10 Marks)

OR

8 a. With a neat sketch, explain Plasma Arc Machining Process. **(10 Marks)**
   b. Discus some of the important considerations in the design of Plasma torch in PAM.
   **(10 Marks)**

99

Module-5

9 a. With a neat sketch, explain working principle of Laser Beam Machining. **(08 Marks)**
   b. What are the advantages and disadvantages of LBM process? **(06 Marks)**
   c. List the limitations and applications of LBM proces. **(06 Marks)**

OR

10 a. Explain with the help of neat diagram Principle of Electron Beam Machining (EBM).
   (10 Marks)
   b. What are the advantages , disadvantages and applications of EBM process? **(10 Marks)**

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CBCS SCHEME

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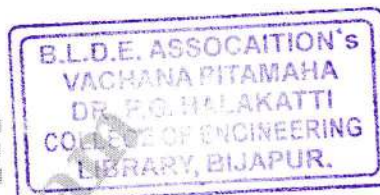
Sixth Semester B.E. Degree Examination, June/July 2023
Advanced Material Technology

Time: 3 hrs.

Max. Marks: 100

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

Module-1

1 a. Discuss the brief classification of Engineering Materials with examples. **(10 Marks)**
   b. List and explain engineering material properties. **(10 Marks)**

OR

2 a. What are the basic steps for material selection? **(10 Marks)**
   b. Identify the different materials used in the field of aero, auto, marine, machinery and nuclear applications. **(10 Marks)**

Module-2

3 a. How do you classify the fibre reinforced composites based on the matrix used? Explain each category. **(10 Marks)**
   b. List and explain the properties and application of : (i) Glass fibers   (ii) Carbon fibers **(10 Marks)**

OR

4 a. Write a note on titanium matrix alloy used in MMCs. **(07 Marks)**
   b. Briefly describe automotive applications of aluminium matrix MMCs. **(08 Marks)**
   c. With suitable sketches, explain the Hand lay up methods of manufacturing PMCs. **(05 Marks)**

Module-3

5 a. List the properties of ceramics. **(05 Marks)**
   b. What is bioceramic material? **(05 Marks)**
   c. Explain in detail bio-reactive glasses and glass ceramics. **(10 Marks)**

OR

6 a. Sketch and explain different methods of processing ceramics. **(10 Marks)**
   b. Explain low temperature and high temperature materials application. **(10 Marks)**

Module-4

7 a. Illustrate the important features of dual steels, micro alloyed and high strength low alloy (HSLA) steel. **(10 Marks)**
   b. Write notes on:
      (i) Inter metallics
      (ii) Ni and Ti Aluminides **(10 Marks)**

OR

8 a. With the help of a neat sketch, explain the production of Boron fibers. **(10 Marks)**
   b. Write a note on Foams, Adhesives and Coatings. **(10 Marks)**

Module-5

9 a. What are shape memory alloys? List the applications of shape memory alloys. Discuss the term "shape memory effect". **(10 Marks)**

b. Discuss varistors and intelligent materials for biomedical applications. **(10 Marks)**

OR

10 a. What are nano materials? Discuss the importance, classification and challenges in nano technology. **(10 Marks)**

b. Write the physical and mechanical properties, applications of nanomaterials. **(10 Marks)**

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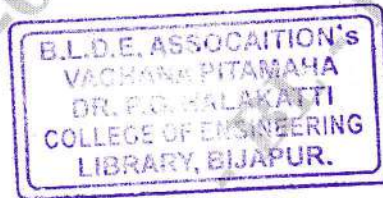
Sixth Semester B.E. Degree Examination, June/July 2023
Non-Conventional Energy Sources

Time: 3 hrs.   Max. Marks: 100

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

Module-1

1   a. Enlist and explain the merits and demerits of any three non-conventional Energy Sources. **(10 Marks)**

    b. Explain Tar Sands and Oil shale as energy sources and mention their limitations. **(10 Marks)**

OR

2   a. With schematic representation, explain mechanism of absorption, scattering beam and diffuse radiation received at earth's surface. **(10 Marks)**

    b. Explain with a neat sketch, explain the working of pyrenometer. **(05 Marks)**

    c. Explain briefly the need for alternate energy sources. **(05 Marks)**

Module-2

3   a. Define the following term with respect to solar radiation:
       i) Hour angle   ii) Declination angle   iii) Zenith angle   iv) Latitude angle
       v) Solar Azimath angle. **(10 Marks)**

    b. Calculate the day length of location (latitude 22° 00′ W, 73° 10′ E) during the month of March 1. **(05 Marks)**

    c. With the usual expression for flux explain beam and diffuse radiation on a tilted surface. **(05 Marks)**

OR

4   a. With a neat sketch explain working of liquid flat-plate collector. **(08 Marks)**

    b. Describe solar pond for solar energy collection and storage. **(07 Marks)**

    c. Explain how solar energy can be used for drying with a neat sketch. **(05 Marks)**

Module-3

5   a. List and discuss the various parameters that affect the performance of collector. **(10 Marks)**

    b. Explain the heat transfer process in LFPc with neat sketch and write the energy balance equation, explaining each terminal. **(10 Marks)**

OR

6   a. Explain the working principle and I-V characteristics of a solar PV cell. **(10 Marks)**

    b. Define : i) Collector efficiency factor   ii) Collector heat removal factor of LPFc write the expression for the above. **(05 Marks)**

    c. What are the applications of solar PV cell? **(05 Marks)**

Module-4

7   a. Describe the main consideration in selecting the site for wind generators. **(10 Marks)**

103

b. Wind blows with a velocity of 15 m/s at 15°C and 1 std. atm. pressure. The turbine diameter is 120m with operating speed of 40 rpm at maximum efficiency. Propeller type wind turbine is considered. Calculate the following :
i) Total power density in the wind stream
ii) Maximum obtainable power density
iii) Obtainable power density
iv) Total power
v) Torque at max η
vi) Maximum axial thrust
Assume R = 0.287 kJ/kgK , η = 35%.

(10 Marks)

OR

8 a. Explain with a sketch, the closed Rankine cycle OTEC system. (10 Marks)
   b. Explain briefly the harnessing of Tidal energy. (05 Marks)
   c. Explain the advantages and disadvantages of Tidal energy. (05 Marks)

Module-5

9 a. State the environmental problem associated with geothermal energy conversion. (05 Marks)
   b. List the factors affecting biogas generation. (05 Marks)
   c. Sketch and explain the working of a fixed dome type biogas plant used in India. (10 Marks)

OR

10 a. What are the different methods of hydrogen production? Describe electrolytic method of hydrogen production. (10 Marks)
    b. Briefly explain the safe utilization of hydrogen energy. (05 Marks)
    c. Describe various methods of storage of hydrogen. (05 Marks)

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104

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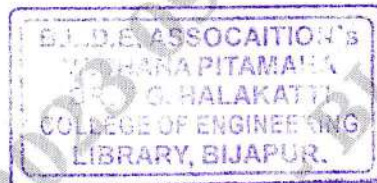
Sixth Semester B.E. Degree Examination, June/July 2023
Supply Chain Management

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 Supply Chain Management? Explain the network of SCM, with a relevant diagram.
                                                                                          (10 Marks)
   b. Explain the importance of SCM in the present context for an Organization.   **(10 Marks)**

OR

2 a. Explain two views of SCM process.   **(12 Marks)**
   b. What is Responsiveness with reference to SCM? How do you achieve it? Explain. **(08 Marks)**

Module-2

3 a. Explain the Strategic Outsourcing process, with a neat flow chart.   **(10 Marks)**
   b. What is Make V/s Buy strategy? How Economics of Scale influences Make V/s Buy
       decision? Explain briefly.   **(10 Marks)**

OR

4 a. What are the two different modes of supplier selection? Explain briefly.   **(10 Marks)**
   b. Why Supplier development is essential to achieve or create a World class supply base.
                                                                                          (10 Marks)

Module-3

5 a. List and explain different objectives of Stores and Warehouse Management.   **(10 Marks)**
   b. Explain briefly different modes of transportation of transporting goods.   **(10 Marks)**

OR

6 a. Explain various factors which influence the distribution network design.   **(08 Marks)**
   b. List and briefly explain the objective function, constraints of following models :
       i) Capacitated plant location model   , ii) Gravity location model.   **(12 Marks)**

Module-4

7 a. Mr. Sampath is planning to open a Computer store. He has 2 choices to make , large or
       small. The demand can be either low or high with probabilities of 0.45 and 0.55 respectively.
       If small store is built at high demand annual revenue is estimated as Rs 20 lakhs. Later he
       can either expand that or do nothing. If he expands the revenue will increase to 40 lakhs with
       an investment for expansion being 5 lakhs. If he does nothing , his revenue will remain same
       as earlier. At low demand he will do nothing and revenue will be 10 lakhs. If he builds large
       store, at high demand , he will earn Rs 80 lakhs annually. At low demand, either he can sell
       it for Rs 30 lakhs or wait for better future which will get him a revenue of Rs 50 lakhs. If the
       cost of building and large store is Rs 30 lakhs and small store is Rs 10 lakhs, which store
       must be built? Use decision tree for your analysis over a 1 year period. Without considering
       discounted cash flow.   **(12 Marks)**
   b. Explain the law of demand and optimal pricing decision with a suitable example. **(08 Marks)**

OR

8 a. Explain the concept of overbooking with relevant model and a suitable example. **(10 Marks)**

b. A Manager at a warehouse department plans for the size of the warehouse. The study reveals that the housing needs is normally distributed with a mean of 6,00,000 square feet and standard deviation of 195, 000. The Manager can lease a warehouse in advance for next 3 years at Rs 300000/year or purchase the warehouse on the spot market at an average of Rs 500000/year. How large, the annual contract should the Manager sign? **(10 Marks)**

Module-5

9 a. Why Integration is necessary in a supply chain? How do you achieve it? Explain. **(10 Marks)**

b. What is Bull Whip effect? What causes it? How do you control it? Explain briefly. **(10 Marks)**

OR

10 a. Explain the concept of Supply Chain Mapping with relevant diagrams. **(10 Marks)**

b. Is information technology a key driver for the success of SCM? What characteristics of Information will support supply chain decision? Explain briefly. **(10 Marks)**

Note : for question 8b , choose the suitable value from the following table :

Value of K	Service level in %
- 0.1	46.0
- 0.2	42.1
- 0.3	38.2
- 0.4	34.5
- 0.5	30.8
- 0.6	27.5
- 0.7	24.5

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