

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

INDEX FILE 7 & 8th SEMESTER QUESTION PAPERS JAN/FEB 2023

5th, 7TH and 8th SEMESTER

ELECTRICAL AND ELECTRONICS DEPARTMENT

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Third Semester B.E. Degree Examination, June/July 2023
Electric Circuit Analysis

Time: 3 hrs.

Max. Marks: 100

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

Module-1

- 1 a. Reduce the given network to a single voltage sources in series with a resistance using source transformation for Fig. Q1 (a).

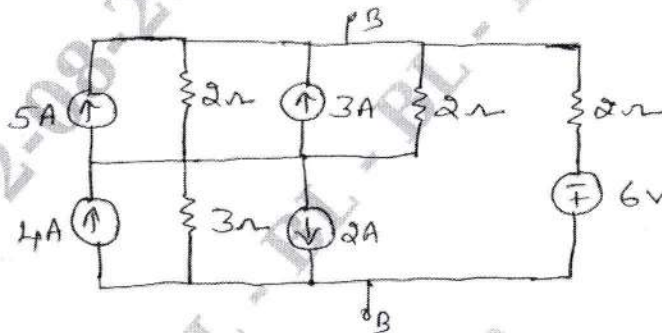


Fig. Q1 (a)

(08 Marks)

- b. Find the equivalent resistance between the terminals A and B using star-delta transformation for Fig. Q1 (b).

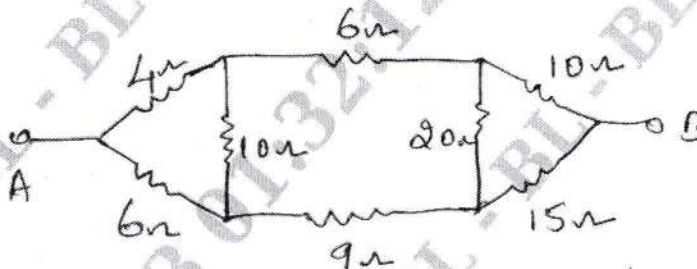


Fig. Q1 (b)

(06 Marks)

- c. Use Mesh Current Analysis to find the current through in 5 Ω resistant of circuit shown in Fig. Q1 (c).

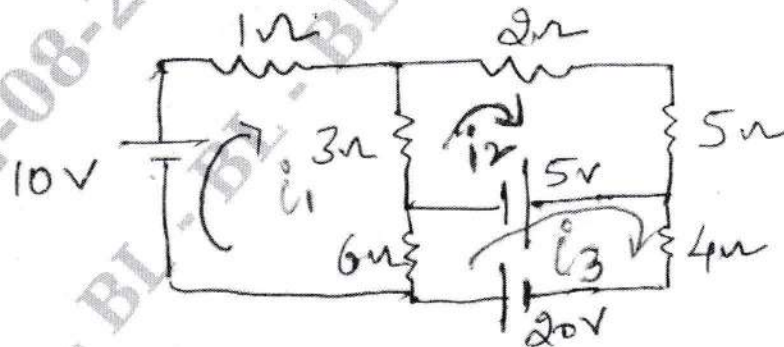


Fig. Q1 (c)

(06 Marks)

OR

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

- 2 a. Using Mesh current analysis, find the value of V such that current through $(2 + j3)\Omega$ is zero for Fig. Q2 (a).

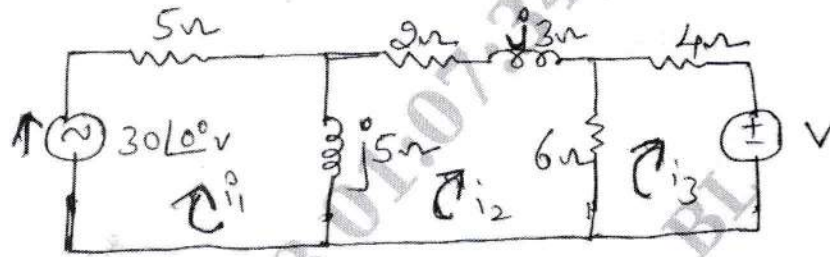


Fig. Q2 (a)

- b. Find all the node voltages for the network shown in Fig. Q2 (b).

(06 Marks)

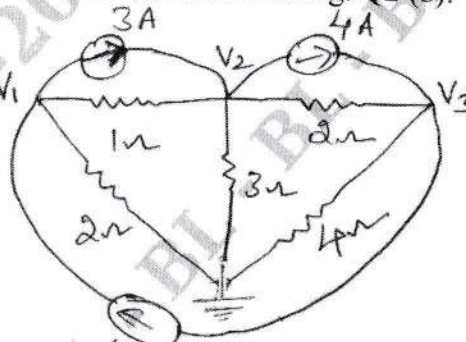


Fig. Q2 (b)

- c. Find all the node voltages for the Network shown in Fig. Q2 (c).

(08 Marks)

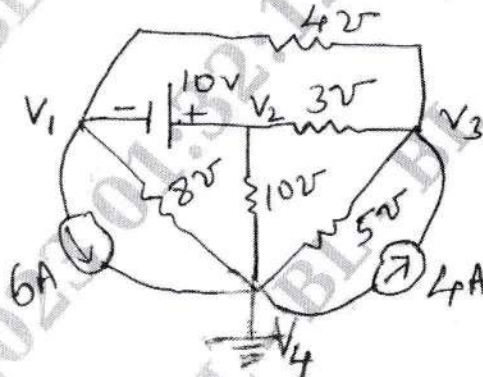


Fig. Q2 (c)

(06 Marks)

Module-2

- 3 a. State and explain Millman's theorem. (06 Marks)
b. Find the current through 2Ω resistance in the network shown below Fig. Q3 (b) using superposition theorem.

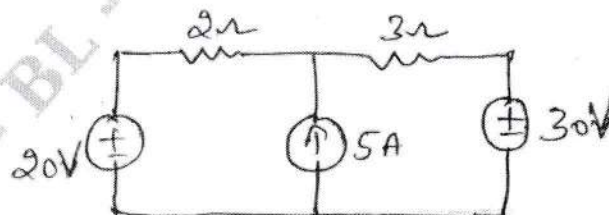


Fig. Q3 (b)

(08 Marks)

- c. Verify the Reciprocity theorem for the circuit shown in Fig.Q3 (c) by finding I.

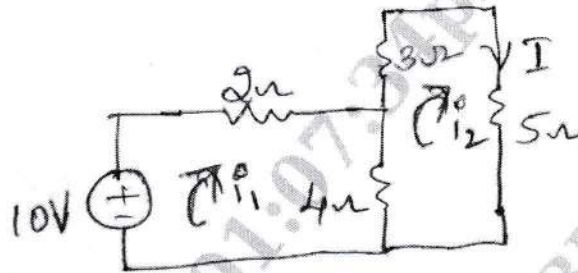


Fig. Q3 (c)

(06 Marks)

OR

- 4 a. Obtain the Thevenin's equivalent of the Network shown in Fig.Q4 (a) between terminals A and B.

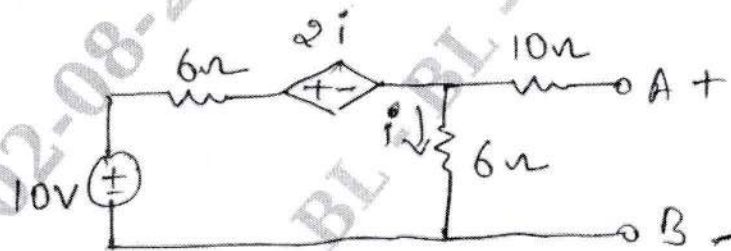


Fig. Q4 (a)

(10 Marks)

- b. Obtain Norton's Equivalent for the network shown in Fig.Q4 (b) and determine the current through 20 Ω.

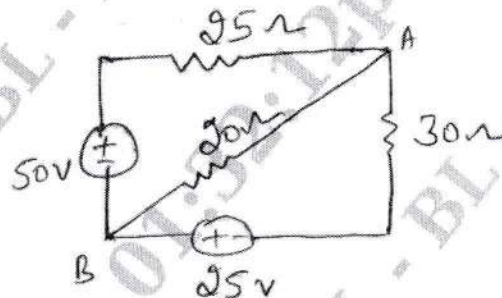


Fig.Q4 (b)

(10 Marks)

Module-3

- 5 a. Show that resonant frequency is the geometric mean of cut-off frequencies. (08 Marks)
 b. A series RLC circuit has $R = 10 \Omega$, $L = 0.01 \text{ H}$ and $C = 0.01 \mu\text{F}$. Calculate Q factor, bandwidth, resonant frequency and half power frequencies. (08 Marks)
 c. Determine the value of R_L and R_C for which the circuit shown in Fig. Q5 (c) resonance at all frequencies.

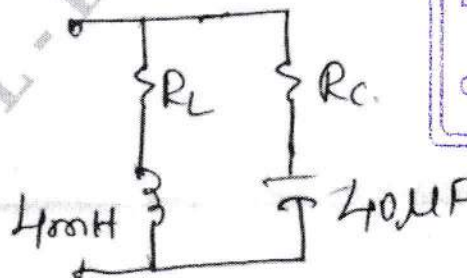


Fig. Q5 (c)

(04 Marks)

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OR

- 6 a. Explain the behavior of R, L and C for initial conditions and final conditions. (07 Marks)
 b. In the network shown in Fig. Q6 (b), if switch is closed at $t = 0$. Determine the current and its first and second derivative at $t = 0^+$.

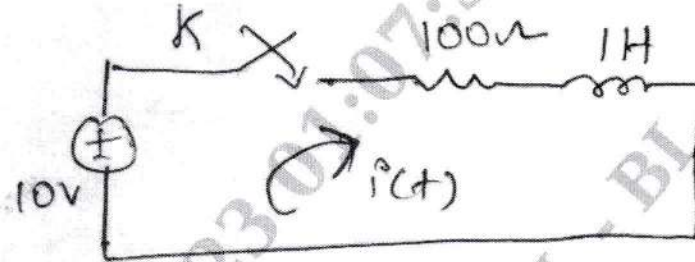


Fig. Q6 (b)

(06 Marks)

- c. In the network Fig. Q6 (c), the switch is moved from position 1 to position 2 at $t = 0$. The steady state has been reached before switching. Calculate i , $\frac{di}{dt}$ and $\frac{d^2i}{dt^2}$ at $t = 0^+$.

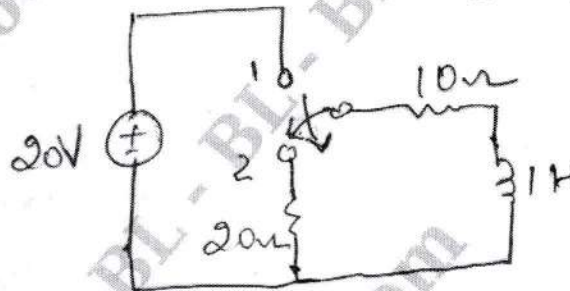


Fig. Q6 (c)

(07 Marks)

Module-4

- 7 a. Find the Laplace transform of the,
 (i) $x_1(t) = \cos \omega t$
 (ii) $x_2(t) = u(t)$.
 (iii) $x_3(t) = t$
 (iv) $x_u(t) = e^{-at} \sin \omega t$ (08 Marks)

- b. Find the Inverse Laplace transform of the following :

(i) $F(s) = \frac{s+2}{s(s+3)(s+4)}$

(ii) $F(s) = \frac{(s-2)}{s(s+1)^3}$ (06 Marks)

- c. Obtain the Laplace transform of the Gate function shown in Fig. Q7 (c).

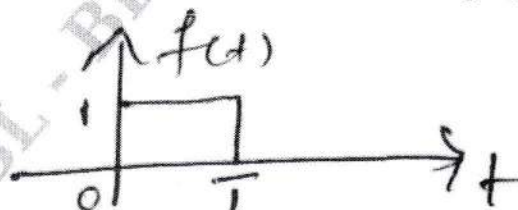


Fig. Q7 (c)

(06 Marks)

OR

- 8 a. State and prove initial value theorem and final value theorem. (10 Marks)
 b. Find the initial and final value of the following functions :

$$(i) \quad I_1(s) = \frac{6.67(s+250)}{s(s+166.7)}$$

$$(ii) \quad I_2(s) = \frac{6.67}{s+166.7}$$

(10 Marks)

Module-5

- 9 a. A 3 phase, 400 V, 4 wire system has a star connected load with $Z_A = 10 \angle 0^\circ \Omega$, $Z_B = (15 + j10) \Omega$, $Z_C = (0 + j5) \Omega$. Find the line current and current through neutral conductor for phase sequence ABC for Fig. Q9 (a).

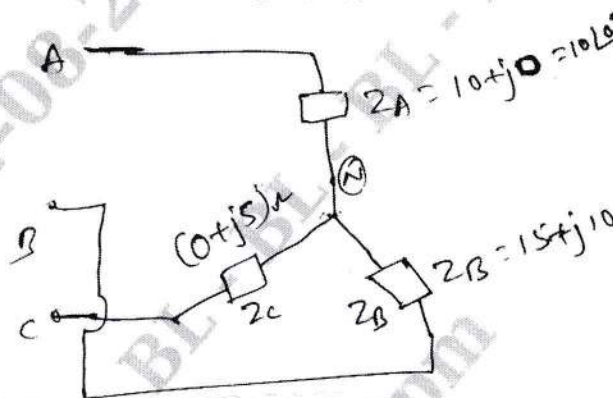


Fig. Q9 (a)

- b. Obtain Y-parameters in terms of ABCD parameters. (10 Marks)

(10 Marks)

OR

- 10 a. Determine the Z-parameters and Y-parameters for the circuit shown in Fig. Q10 (a).

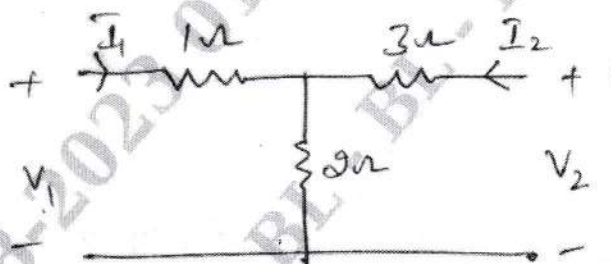
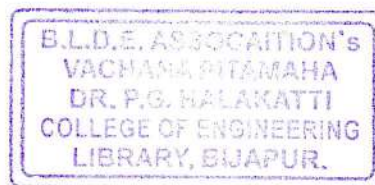


Fig. Q10 (a)

- b. The impedance parameters of a 2 port network are $Z_{11} = 6 \Omega$, $Z_{22} = 4 \Omega$, $Z_{12} = Z_{21} = 3 \Omega$. Compute the Y-parameters and ABCD parameters. (10 Marks)

(10 Marks)



CBCS SCHEME

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18EE33

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

Transformers and Generators

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 no load phasor diagram of transformer. Express magnetizing current and loss component of the no load current in terms of the no load current and no load power factor. (06 Marks)
- b. The following results were obtained a 50KVA, 2400/120V transformer :
- O.C Test, Instruments, on L.V site
Wattmeter reading = 396W
Ammeter reading = 9.65A
Voltmeter reading = 120V
- S.C Test, Instruments on h.r. site
Wattmeter reading = 810W
Ammeter reading = 20.8A
Voltmeter reading = 92V
- Determine :
- The circuit constants
 - Efficiency of full load, 0.8 p.f lagging
 - Approximate voltage regulation 0.8p.f lag
- (09 Marks)
- c. What are the advantages of transformer bank of three 1-phase transformer over a unit three phase transformer of the same KVA rating? (05 Marks)

OR

- 2 a. Explain with the help of connection and phasor diagrams, how Scott connections are used to obtain two phase supply form 3-phase supply mains. (07 Marks)
- b. A 10 KVA single phase transformer rated for 2000/400 V has resistance and leakage reactances as follows :
- Primary winding : $R_1 = 5.5\Omega$, $x_1 = 12\Omega$
Secondary winding : $R_2 = 0.2\Omega$, $x_2 = 0.45\Omega$
- Determine the approximate value of the secondary voltage at full load 0.8 p.f lagging when the primary voltage is 2000V and also calculate the voltage regulation. (06 Marks)
- c. A 2300/230V, 500KVA, 50Hz distribution transformer has core loss of 1600W at rated voltage and copper loss of 7.5kW at full load. During the day it is loaded as follows :

% load	0	20	50	80	100	125
Power factor	-	.7 lag	.8lag	.9 lag	1	.85 lag
Hours	2	4	4	5	7	2

Calculate all day efficiency.

(07 Marks)

Module-2

- 3 a. State the need for parallel operation of transformers and also explain the various conditions of parallel operation of single phase transformer. (06 Marks)
- b. Two single phase transformer having the same voltage ratio on no-load operate in parallel to supply a load of 1000KVA at 0.8 p.f lagging. One transformer is rated at 400 KVA and has equivalent impedance of $(0.015 + j 0.09)\Omega$, other is rated at 600 KVA and has a equivalent impedance of $(0.01 + j.05) \Omega$. Determine the load on each transformer in KVA and the operating power factor. (07 Marks)

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

- c. Make a comparison in the weight of copper required in an auto transformer and a two winding transformer of the same rating. (07 Marks)

OR

- 4 a. Two similar 200 KVA, I-phase transformers gave the following results when tested by back-to-back method :
 W_1 in supply line, 4kW, W_2 in series circuit, when full load current circulates through the secondaries, 6kW. Calculate efficiency of each transformer at .8p.f lag with full load condition. (06 Marks)
- b. Explain how Iron loss can be separated into hysteresis loss eddy current loss. (07 Marks)
- c. With help of sketches explain working of on load tap changing transformer. (07 Marks)

Module-3

- 5 a. Derive the equation for AT_d/pole and AT_c/pole . (07 Marks)
- b. Derive the expression for pitch factor and distribution factors in connection with alternator. (07 Marks)
- c. A 3-phase, 16-pole synchronous generator has a resultant air gap flux of 0.04wb per pole. The flux is distributed sinusoidally over the pole. The stator has 2 slots per pole per phase and 6 conductors per slot are accommodated. The coil span is 160° electrical. Calculate phase and line induced voltages when the machine is runs at 375 rpm. (06 Marks)

OR

- 6 a. Explain the process of commutation in d.c generator with neat sketches. (06 Marks)
- b. Explain the phenomena of armature reaction when alternator is delivering a load current at i) purely lagging ii) unity iii) purely leading p.f (09 Marks)
- c. Define term synchronous reactance and draw equivalent circuit diagram of the alternator. (05 Marks)

Module-4

- 7 a. Draw the phasor diagram a loaded alternator for the following conditions :
 i) lagging p.f ii) leading p.f ii) upf. (06 Marks)
- b. For cylindrical rotor alternator an expression for power developed a function of load angle (07 Marks)
- c. A 3-phase, 1500KVA, star connected, 50Hz, 2300V alternator has a resistance of 0.12Ω . A field current 70A produces a short circuit current equal full load current of 376 A. The same field current produces an emf of 700V on open circuit. Determine the synchronous reactance of machine and its full load regulation at 0.8 p.f lagging. (07 Marks)

OR

- 8 a. Explain the Potier- triangle method of determining the voltage regulator of an alternator. (10 Marks)
- b. A 3-phase, star connects, 1000KVA, 2000V, 50Hz alternator gave the following open circuit and short circuit ratings.

Fields current – (A)	10	20	25	30	40	50
O.C voltage (V) (LL)	800	1500	1760	2000	2350	2600
S.C current (A)	-	200	250	300		

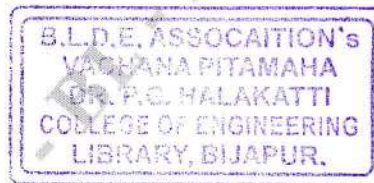
The armature effective resistance per phase 0.2Ω . Determine the full load percentage 9 regulation at 0.80 p.f leading using MMF method. (10 Marks)

Module-5

- 9 a. Explain the two reaction theory applicable to salient pole synchronous machine. (07 Marks)
b. What is necessity of parallel operation of alternator and list conditions necessary for paralling alternators. (06 Marks)
c. Explain the slip test to determine X_d and X_q (07 Marks)

OR

- 10 a. Write a note on capability curve for large turbo alternator. (07 Marks)
b. Derive expression for synchronizing power when two alternators are connected in parallel. (06 Marks)
c. What is hunting in an alternator? Discuss the measures to be taken to minimize hunting. (07 Marks)



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Third Semester B.E. Degree Examination, June/July 2023 Analog Electronic Circuit

Time: 3 hrs.

Max. Marks: 100

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

Module-1

1.
 - a. Define Q or Operating point (02 Marks)
 - b. What is a clipper circuit? Explain the working of a double ended clipper with a suitable diagram. (08 Marks)
 - c. List various types of clamper circuit. With a neat circuit diagram, explain the working of a negative clamper. (10 Marks)

OR

2.
 - a. Discuss emitter stabilized bias circuit. Also derive expression for I_B , I_C , V_B and V_C . (10 Marks)
 - b. Determine the following for the fixed bias configuration of Fig.2(b). Assume $\beta=50$.
 (i) I_{BQ} and I_{CQ} (ii) V_{CEQ} (iii) V_B and V_C (iv) V_{BC}

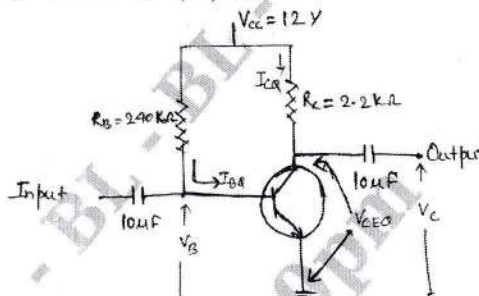


Fig.Q.2(b)

(10 Marks)

Module-2

3.
 - a. Derive an expression for A_v , Z_i and Z_o of CE voltage divider bias circuit using hybrid model. (10 Marks)
 - b. For the collector feedback configuration of Fig 3(b), calculate (i) r_c (ii) Z_i and Z_o (iii) A_v and A_f Consider $\beta=200$, $r_o=60K\Omega$.

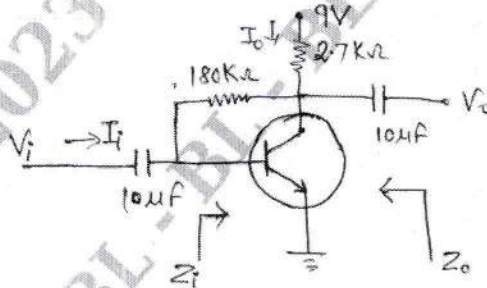


Fig.3(b)

(10 Marks)

OR

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2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

- 4 a. For the network of fig 4(a), determine: (i) r_e (ii) Z_i (iii) Z_o ($r_o = \infty$) (iv) A_v ($r_o = \infty$) (10 Marks)

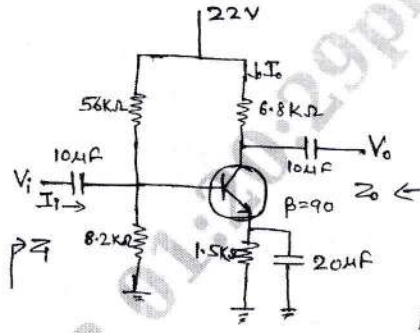


Fig.4(a)

- b. Why hybrid model is called as hybrid? Obtain h – parameters from equivalent circuit of common – emitter configuration. (10 Marks)

Module-3

- 5 a. Define Multistage Amplifier. Derive voltage gain and current gain of a two stage cascaded amplifier. (10 Marks)
b. Derive an expression for Z_i and A_i for Darlington Emitter follower circuit. (10 Marks)

OR

- 6 a. Find out input and output impedance of a current series feedback amplifier. (10 Marks)
b. Determine the voltage gain, input and output impedance with feedback for voltage series feedback having $A = -100$, $R_i = 10 \text{ k}\Omega$, $R_o = 20 \text{ k}\Omega$ for feedback of
i) $\beta = -0.1$ and ii) $\beta = -0.5$. (10 Marks)

Module-4

- 7 a. With a neat circuit diagram, explain the AC Operation of series – fed class – A amplifier. Also derive maximum efficiency of the amplifier. (10 Marks)
b. Show that maximum efficiency of Class – B push pull power amplifier is 78.54%. (10 Marks)

OR

- 8 a. Explain the working of R.C phase shift oscillator. If $R = 1 \text{ k}\Omega$, $R_c = 1 \text{ k}\Omega$ and $C = 0.1 \mu\text{f}$, Calculate the frequency of oscillations. (10 Marks)
b. Discuss the working of Wein Bridge Oscillator, with a suitable diagram. (10 Marks)

Module-5

- 9 a. Describe the working and characteristics of M – Channel JFET. (10 Marks)
b. For a self – bias circuit, $V_{DD} = +20$, $R_D = 3.3 \text{ k}\Omega$, $R_G = 1 \text{ M}\Omega$, $R_S = 1 \text{ k}\Omega$, $I_{DSS} = 8 \text{ mA}$ and $V_P = -6 \text{ V}$. Determine i) V_{GS} ii) I_D iii) V_{DS} iv) V_S v) V_G vi) V_D . (10 Marks)

OR

- 10 a. With a neat structure, explain the operation of an n – channel depletion type MOSFET. (10 Marks)
b. Compare JFET with MOSFET. Sketch the transfer characteristics for an N – channel depletion type MOSFET with $I_{DSS} = 10 \text{ mA}$ and $V_P = -4 \text{ V}$. (10 Marks)

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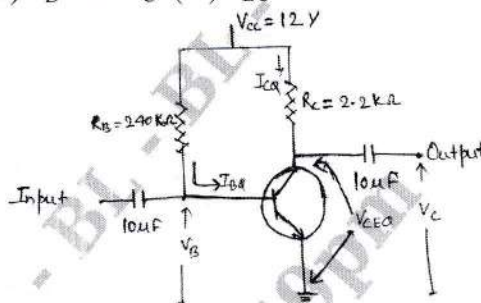


Fig.Q.2(b)

(10 Marks)

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- 3 a. Derive an expression for A_v , Z_i and Z_o of CE voltage divider bias circuit using hybrid model. (10 Marks)
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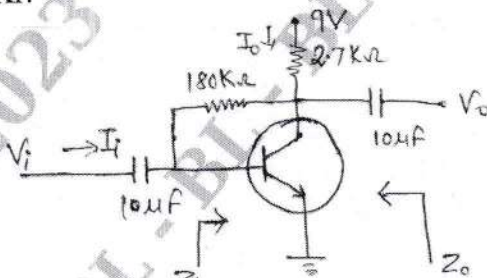


Fig.3(b)

(10 Marks)

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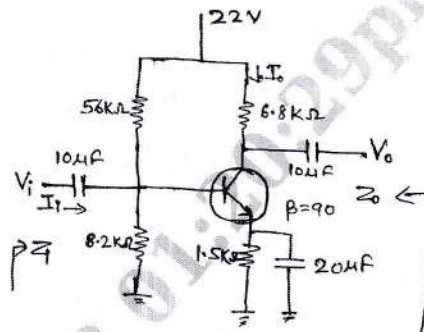


Fig.4(a)

- b. Why hybrid model is called as hybrid? Obtain h – parameters from equivalent circuit of common – emitter configuration. (10 Marks)

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b. Compare JFET with MOSFET. Sketch the transfer characteristics for an N – channel depletion type MOSFET with $I_{DSS} = 10\text{ mA}$ and $V_P = -4\text{ V}$. (10 Marks)

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Third Semester B.E. Degree Examination, June/July 2023 Digital System Design

Time: 3 hrs. Max. Marks: 100

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

Module-1

- 1 a. Simplify the following in SOP form using K-Map
 $f(A, B, C, D) = \overline{A} \overline{B} C + AD + \overline{B} D + \overline{C} D + AC$ (05 Marks)
- b. Identify all prime implicants and essential prime implicants of the following functions using K-map $f(a, b, c, d) = \pi M(0, 2, 3, 8, 9, 10, 12, 14)$. (05 Marks)
- c. Using Quine McCluskey tabulation method, obtain the set of prime implicants for the function : $f(a, b, c, d) = \Sigma(0, 1, 4, 5, 9, 10, 12, 14, 15) + \Sigma\phi(2, 8, 13)$ and hence obtain the minimal form of the given function employing decimal representation. (10 Marks)

OR

- 2 a. Reduce the function using K-map technique :
 $F(A, B, C, D, E) = \Sigma m(1, 4, 8, 10, 11, 20, 22, 24, 25, 26) + d(0, 12, 16, 17)$. (10 Marks)
- b. Simplify using Quine McCluskey tabulation algorithm :
 $V = f(a, b, c, d) = \Sigma(2, 3, 4, 5, 13, 15) + \Sigma d(8, 9, 10, 11)$. (10 Marks)

Module-2

- 3 a. Explain the concept of carry look ahead adder. (07 Marks)
- b. Design and implement a 2 bit compactor. (08 Marks)
- c. Implement the following Boolean function with 8 : 1 multiplexer
 $F(A, B, C, D) = \Sigma m(0, 2, 6, 10, 11, 12, 13) + d(3, 8, 14)$. (05Marks)

OR

- 4 a. Design a 4-bit parallel adder/subtractor using 7483. (10 Marks)
- b. Write the condensed truth table for a 4 to 2 line priority encoder with a valid output where the highest priority is given to the highest bit Position or input with highest index and obtain the minimal sum expressions for the outputs. (10 Marks)

Module-3

- 5 a. Explain the working of a master-slave JK FF with the help of logic diagram, function table, logic symbol and timing diagram. (10 Marks)
- b. Obtain the characteristic equation for D and T flip-flop. (06 Marks)
- c. What do you mean by sequential circuit? Explain the help of block diagram. (04 Marks)

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

OR

- 6 a. With a neat logic diagram, explain the working of positive edge triggered D flip-flop. (10 Marks)
 b. Explain race around condition. How is it eliminated? (05 Marks)
 c. Realize SR flip-flop using only NOR Gates. (05 Marks)

Module-4

- 7 a. Design BCD ripple counter using JK flip-flop. (10 Marks)
 b. Explain with suitable logic and timing diagram :
 i) SISO
 ii) PIPO. (10 Marks)

OR

- 8 a. Design a MOD-5 synchronous counter using JK flip-flop and implement it. Also draw the timing diagram. (10 Marks)
 b. Explain Johnson counter with its circuit diagram and timing diagram. (10 Marks)

Module-5

- 9 a. Explain Mealy model and Moore model for clocked synchronous sequential network. (10 Marks)
 b. A sequential circuit with 2D ffs A and B and input X and output Y is specified by the following next state and output equations :
 $A(t+1) = AX + BX$
 $B(t+1) = A'X$
 $Y = (A + B)X'$
 i) Draw the logic diagram of the circuit
 ii) Derive the state table
 iii) Derive state diagram. (10 Marks)

OR

- 10 a. A sequential circuit has one input and one output. The state diagram is shown in Fig.Q10(a). Design the sequential circuit with T flip-flop.

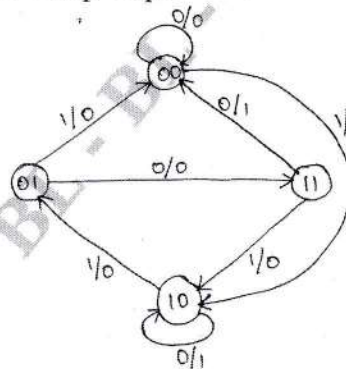


Fig.Q10(a)

- b. Write short notes on :
 i) PROM
 ii) Flash memory.

(10 Marks)

(10 Marks)

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Third Semester B.E. Degree Examination, June/July 2023 Electrical and Electronics Measurements

Time: 3 hrs.

Max. Marks: 100

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

Module-1

- 1 a. Define sensitivity of Wheatstone bridge and obtain expression for sensitivity of bridge. (10 Marks)
- b. Explain the construction and working of megger with neat sketch. (10 Marks)

OR

- 2 a. Describe the working of Anderson's bridge. Derive equation for inductance and quality factor. (10 Marks)
- b. Explain sources and detectors in A.C. bridges. (04 Marks)
- c. A sheet of Bakelite 5mm thick is tested at 50Hz between electrodes 0.12m in diameter. The shearing bridge employs a standard air capacitor C_2 of 106pf, a standard non-inductive resistance R_4 of $\frac{1000}{\pi} \Omega$ in parallel with a variable capacitor C_4 and a non-inductive variable resistance R_3 balance is obtained with $C_4 = 0.5\mu\text{f}$ and $R_3 = 260\Omega$. Calculate the capacitance, power-factor and relative permittivity of the sheet. (06 Marks)

Module-2

- 3 a. Explain the error in Wattmeter and explain adjustments done to compensate errors in wattmeter. (08 Marks)
- b. Explain with the help of neat sketch calibration of energy meter. (06 Marks)
- c. A 250V, single phase energy meter has a constant load of 5A passing through it for 8 hours at 0.8pf. If the disc makes 3,200 revolutions during this period, what is the energy meter constant in revolutions per kWh? Calculate the p.f of the load if the number of revolutions made by energy meter is 600, when operating at 250V, 6A for 2 hours. (06 Marks)

OR

- 4 a. Explain the construction and working of dynamometer type power factor meter. (08 Marks)
- b. Explain the working of Weston frequency meter. (08 Marks)
- c. Explain the working of phase sequence indicator. (04 Marks)

Module-3

- 5 a. What do you mean by shunts and multipliers and derive the expression for shunt and multipliers. (06 Marks)
- b. Obtain transformation ratio and phase angle of current transformer with the help of equivalent circuit and phasor diagram. (08 Marks)
- c. A current transformer has a turns ratio 1:99 and is rated as 500/5A, 15VA. The magnetizing and core loss components of exciting current are 8A and 4A respectively. Determine the ratio error and phase angle for the rated burden and rated secondary current at 0.8pf leading neglect the resistance and leakage reactance of secondary winding. (06 Marks)

OR

- 6 a. Explain the method of obtaining flux density of magnetic material. (08 Marks)
 b. Explain Silsbee method of testing CT. (06 Marks)
 c. Explain the measurement of leakage factor using search coil. (06 Marks)

Module-4

- 7 a. List the characteristics of DVM. (04 Marks)
 b. With the help of block-diagram, explain the working of true RMS voltmeter. (08 Marks)
 c. With the help of block-diagram explain the working of ramp type DVM. (08 Marks)

OR

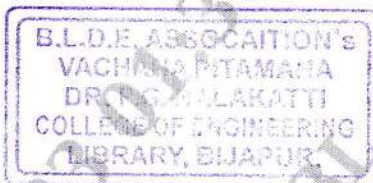
- 8 a. Explain with the help of diagram, integrating type DVM. (08 Marks)
 b. With the help of neat sketch, explain the working of Q-meter. (06 Marks)
 c. Explain the working of successive approximation type DVM. (06 Marks)

Module-5

- 9 a. Explain LED and LCD displays. (08 Marks)
 b. Write short notes on Nixie tube. (06 Marks)
 c. Write short notes on:
 i) Dot-matrix displays
 ii) Bar matrix display. (06 Marks)

OR

- 10 a. With the help of neat sketch, explain the working of strip-chart recorder. (06 Marks)
 b. Explain with the help of block diagram ECG. (06 Marks)
 c. Explain the working of X-Y recorder with neat sketch. (08 Marks)



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.
-
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

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 earlier.
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) Plagiarism d) All of these
13. The three types of Justice referred 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 chosen by the members of Lok Sabha d) is elected by the members of parliament

24. Financial Emergency 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 portfolios 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?
 a) 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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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 of $2^t + \frac{\cos 2t + \cos 3t}{t}$ (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 $f(t) = \begin{cases} \sin t & 0 < t < \pi \\ \sin 2t & \pi < t < 2\pi \\ \sin 3t & t \geq 2\pi \end{cases}$ (06 Marks)
- b. Find the inverse Laplace transform of $\frac{2s^2 - 6s + 5}{(s-1)(s-2)(s-3)}$ (07 Marks)
- c. Solve the using Laplace transform method $y''(t) + 4y'(t) + 4y = e^{-t}$ $y(0) = 0$ $y'(0) = 0$ (07 Marks)

Module-2

- 3 a. Obtain the Fourier series of $f(x) = \frac{\pi - x}{2}$ 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)

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

OR

- 4 a. Obtain the Fourier series of $f(x) = x \cos x$ in the interval $-\pi \leq x \leq \pi$. (06 Marks)
 b. Obtain the sine half range Fourier series for the function,

$$f(x) = \begin{cases} \frac{2Kx}{\ell} & \text{in } 0 \leq x \leq \frac{\ell}{2} \\ \frac{2K}{\ell}(\ell - x) & \text{in } \frac{\ell}{2} \leq x \leq \ell \end{cases}$$

(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 $\int_0^{\infty} \left(\frac{\sin s - s \cos s}{s^3} \right) ds = \frac{\pi}{2}$. (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 $\frac{2z^2 + 3z}{(z+2)(z-4)}$. (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) $\frac{\partial^2 u}{\partial x^2} + 4 \frac{\partial^2 u}{\partial x \partial y} + 4 \frac{\partial^2 u}{\partial y^2} - \frac{\partial u}{\partial x} + 2 \frac{\partial u}{\partial y} = 0$

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

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

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

(10 Marks)

- b. 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 $0 < x < 5, t \geq 0$ 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 $\frac{\partial t}{\partial y} - \frac{d}{dx} \left(\frac{\partial t}{\partial y_1} \right) = 0$. (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 $y(0) = y(\pi/2) = 0$. (07 Marks)

OR

- 10 a. Apply Milne's predictor corrector method to solve $\frac{d^2 y}{dx^2} = 1 - 2y \frac{dy}{dx}$ 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 $\int_0^{\pi/2} (y'^2 - y^2 + 2xy) dx, y(0) = 0, y(\pi/2) = 0$ be extremized. (07 Marks)

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Third Semester B.E. Degree Examination, June/July 2023 Analog Electronic Circuits and Op-Amps

Time: 3 hrs.

Max. Marks: 100

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

Module-1

- 1 a. For the clipper circuit shown in Fig.Q.1(a), draw the output voltage waveform and transfer characteristics. (07 Marks)

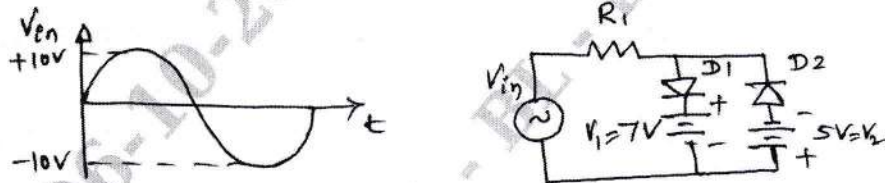


Fig.Q.1(a)

- b. Find the operating point for the voltage divider bias circuit with $\beta = 80$ and $V_{BE} = 0.6V$. Find the new operating point when β changes to 100 and V_{BE} changes to 0.25. Given: $V_{CC} = 15V$, $R_1 = 100K\Omega$, $R_2 = 18K\Omega$, $R_C = 10K\Omega$, $R_E = 1K\Omega$. (07 Marks)
- c. With neat circuit and waveforms, explain the operation of positive clamper. (06 Marks)

OR

- 2 a. For the circuit shown in Fig.Q.2(a), find the operating point for $R_B = 150K\Omega$ and $R_B = 300K\Omega$. (08 Marks)

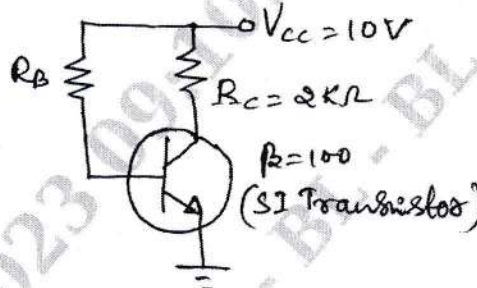


Fig.Q.2(a)

- b. Define and explain h-parameters. (05 Marks)
- c. With neat circuit and waveforms, explain the common Emitter amplifier limit. (07 Marks)

Module-2

- 3 a. Explain the need of cascading amplifier. Draw and explain the block diagram of n-stage cascaded amplifier. (07 Marks)
- b. An amplifier with open loop voltage gain of 1000 delivers 10W of power output at 10% second harmonic distortion when the input is 10mV. If 40dB negative feedback is applied and power output remaining 10W. Determine required input signal V_s and second harmonic distortion with feed back. (06 Marks)
- c. Derive an expressions for Z_i , A_i and A_v for Darlington Emitter follower. (07 Marks)

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

OR

- 4 a. Derive an expression for gain of a feedback amplifier with negative feedback. (06 Marks)
 b. If an amplifier has bandwidth of 300kHz and voltage gain of 100. What will be the new bandwidth and gain if 10% negative feedback is introduced? What will be the gain bandwidth product before and after feedback? What should be the amount of feedback if the bandwidth is to be limited to 800kHz? (07 Marks)
 c. Draw the neat diagram of voltage series feedback amplifier and also derive expression for input resistance. (07 Marks)

Module-3

- 5 a. How classification of power amplifier is done based on the location of Q-point? Also indicate the operating cycle in each case. (08 Marks)
 b. Explain the operation of push pull class B power amplifier. Also show that the maximum efficiency is 78.5%. (07 Marks)
 c. For a class-A amplifier with $V_{CC} = 20V$ driving an 8Ω load, determine:
 i) DC power
 ii) Maximum output power
 iii) Maximum limit efficiency. (05 Marks)

OR

- 6 a. Explain the construction, working and characteristics of n-channel JFET. (10 Marks)
 b. Explain the construction, working and characteristics of depletion type MOSFET. (10 Marks)

Module-4

- 7 a. Explain with a neat diagram inverting and non-inverting summing amplifiers. (10 Marks)
 b. What is an instrumentation amplifier? Obtain an expression for input voltage V_0 , in terms of change in resistance ΔR of an instrumentation amplifier using transducer bridge. (10 Marks)

OR

- 8 a. With a neat limit diagram explain working of 1st order low pass filter and its typical frequency response curve. (10 Marks)
 b. An LM317 regulator is to provide 6V output from 15V supply. The load current is 200mA. Determine the suitable resistance values for R_1 and R_2 , and calculate the regulator power dissipation. (04 Marks)
 c. Mention the advantages of active filter over passive filter (any six). (06 Marks)

Module-5

- 9 a. With a neat limit diagram, explain the working of triangular/rectangular wave generator. (10 Marks)
 b. Design a RC phase shift oscillator using Op-amp for a frequency of 500 Hz. Also draw the limit diagram and name the component values take $C = 0.1\mu F$. (06 Marks)
 c. With a neat limit diagram, explain comparator as a zero crossing detector. (04 Marks)

OR

- 10 a. With a neat limit diagram and necessary derivation for load current, explain voltage to current converter with grounded load. (10 Marks)
 b. With a neat limit diagram, explain inverting comparator as Schmitt trigger. (10 Marks)

CBCGS SCHEME

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21EE33

Third Semester B.E. Degree Examination, June/July 2023 Electric Circuit Analysis

Time: 3 hrs.

Max. Marks: 100

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

Module-1

- 1 a. Write a note on :
 - i) Active element and passive element
 - ii) Ideal source and practical sources.
- b. Find power delivered by 50V voltage source using source transformation for the Fig.Q1(b).

(10 Marks)

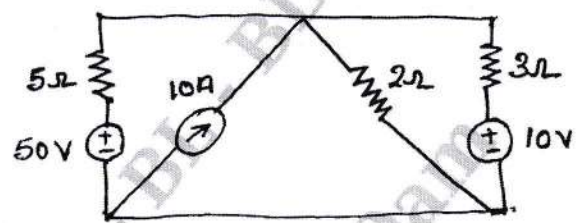


Fig.Q1(b)

(10 Marks)

OR

- 2 a. Find power dissipated in 10Ω resistor shown in Fig.Q2(a) by Nodal voltage method i.e across ab.

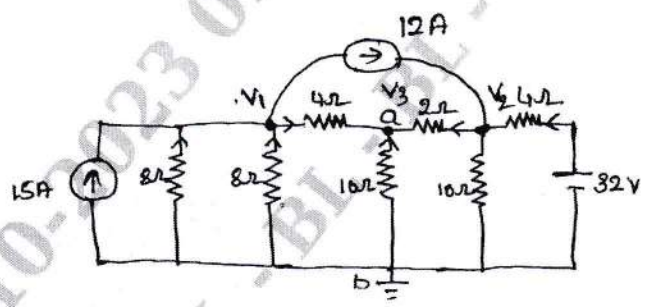


Fig.Q2(a)

(10 Marks)

- b. Determine equivalent resistance using Y-Δ transformation for the circuit shown in Fig.Q2(b).

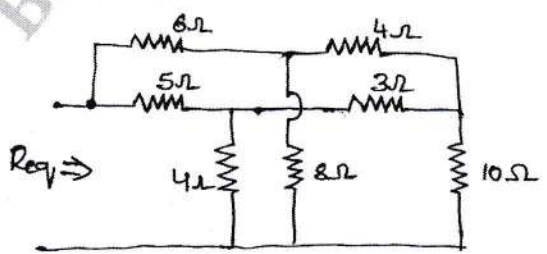


Fig.Q2(b)

(10 Marks)

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

Module-2

- 3 a. Define superposition theorem and find 'va' using the principle of superposition theorem shown in Fig.Q3(a).

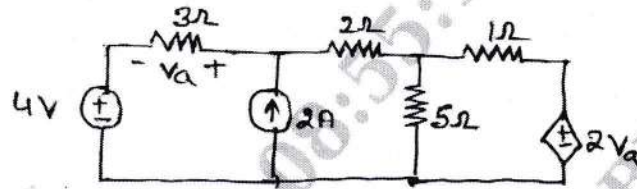


Fig.Q3(a)

(10 Marks)

- b. Define reciprocity theorem and find 'vx' in the circuit shown in Fig.Q3(b) and hence verify reciprocity theorem.

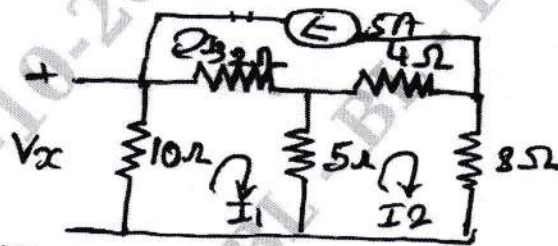


Fig.Q3(b)

(10 Marks)

OR

- 4 a. State and explain maximum power transfer theorem when load impedance is equal to pure variable resistance. (10 Marks)
- b. Find the current through '16Ω' resistor in circuit shown in Fig.Q4(b) using Norton's theorem.

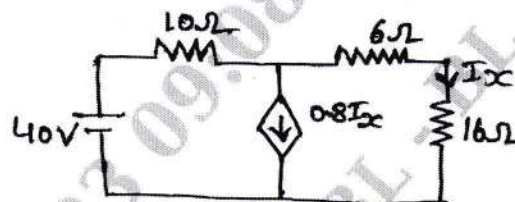


Fig.Q4(b)

(10 Marks)

Module-3

- 5 a. The switch K is changed from position 1 to position 2 at $t = 0$ steady state condition have been reached at position 1 find the values of i , $\frac{di}{dt}$ and $\frac{d^2i}{dt^2}$ at $t = 0^+$. (Refer Fig.Q5(a)).

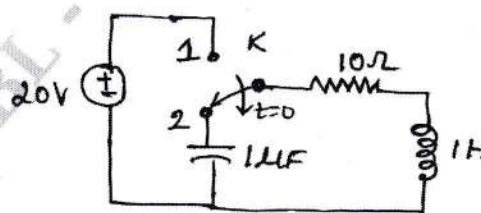


Fig.Q5(a)

(10 Marks)

- b. Show that for a series RLC resonant circuit, the selectivity $Q_0 = \frac{f_0}{f_2 - f_1}$ where $f_0 \rightarrow$ resonant frequency and f_1, f_2 are half power frequency. (10 Marks)

OR

- 6 a. A constant voltage of frequency 1MHz is applied to an inductor coil in series with capacitor, when the capacitor is said at 500pF the current as its maximum value, while the current is reduced to one half when capacitance is 600pF find the following :
- The resistance and inductance of the coil
 - Q-factor of the coil.
- (10 Marks)
- b. In the networks shown in Fig.Q6(b), $v_1(t) = e^{-t}$ for $t \geq 0$ is zero for all $t < 0$, if capacitor is initially uncharged determine the value of $\frac{d^2 v_2}{dt^2}$ and $\frac{d^3 v_2}{dt^3}$ at $t = 0^+$.

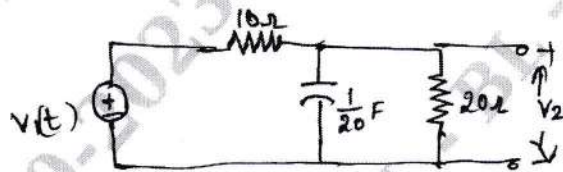


Fig.Q6(b)

(10 Marks)

Module-4

- 7 a. State and prove initial and final value theorem in Laplace transformation. (10 Marks)
- b. Using initial and final value theorem, where they apply, find $f(0)$ and $f(\infty)$ for the following function : $F(s) = \frac{s^3 + 7s^2 + 5}{s(s^3 + 3s^2 + 4s + 2)}$. (10 Marks)

OR

- 8 a. Obtain the Laplace transfer of the function shown in Fig.Q8(a).

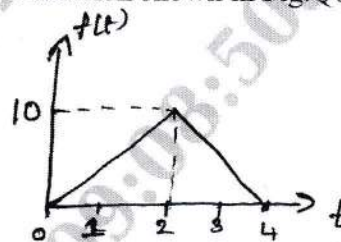


Fig.Q8(a)

(10 Marks)

- b. Derive the relation between unit step and unit ramp function. (10 Marks)

Module-5

- 9 a. A 3 ϕ , 4 wire system 150V, CBA sequence has Y-connected load with $Z_A = 6 \angle 0^\circ$, $Z_B = 6 \angle 30^\circ$ and $Z_C = 5 \angle 45^\circ \Omega$. Obtain all line current and draw a phasor diagram. (10 Marks)
- b. Find y parameter of two port networks shown in Fig.Q9(b).

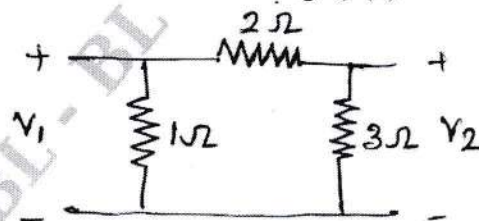


Fig.Q9(b)

(10 Marks)

OR

- 10 a. Express 'y' parameter interm of 'Z' parameter. (10 Marks)
- b. Determine the line current and total power supplied to a delta connected load of $Z_{ab} = 10 \angle 60^\circ \Omega$, $Z_{bc} = 20 \angle 90^\circ$, $Z_{ca} = 25 \angle 30^\circ \Omega$. Assume a 3-phase, 400v, ABC system.

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21EE34

Third Semester B.E. Degree Examination, June/July 2023 Transformer and Generators

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 load phasor diagram of a 10 transformer supplying lagging, leading and unity PF (Power Factor). (08 Marks)
- b. With the help of a neat diagram and phasor diagram explain the operation of a 3 ϕ star delta transformer. (06 Marks)
- c. The equivalent of a 200/400V, step up transformer has the following parameters referred to LV side equivalent resistance = 0.15Ω , equivalent reactance = 0.37Ω , core loss component of resistance = 600Ω , magnetizing reactance = 300Ω . When the transformer is supplying load of 10A at a P.F of 0.8 calculate :
- Primary current
 - Secondary terminal voltage.
- (06 Marks)

OR

- 2 a. Explain with the help of connection and phasor diagram how Scott connections are used to obtain two phase from three phase supply. (06 Marks)
- b. What is all day efficiency of transformer? Explain its importance in distribution transformers. (04 Marks)
- c. A 5KVA, 500/250V, 50Hz single phase transformer gave the following readings :
OC test : 500V, 1A, 50W [LV side open]
SC test : 25V, 10A, 80W [LV side shorted]
Determine :
- Efficiency on full load and 0.8pF lagging
 - Voltage regulation on full load 0.8 pF leading
 - Efficiency on 60% of full load and 0.8 pF leading
 - Draw the equivalent circuit referred to primary and insert all values in it. (10 Marks)

Module-2

- 3 a. Why Parallel operation of 2 single phase transformers are needed and mention the necessary conditions to be satisfied for parallel operation. (06 Marks)
- b. Two 250KVA transformers supplying a network are connected in parallel on both primary and secondary sides. Their voltage ratios are same the resistance drops are 1.5% and 9% and reactance drops are 3.33% and 4% respectively. Calculate the KVA loading on each transformer and as power factor. When the total load on the transformers is 500KVA at 0.707 lagging power factor. (08 Marks)
- c. With a neat circuit diagram explain Sumpner's test condited on 2 identical transformers also show how efficiency and regulation are calculated form Sumpner's test data. (06 Marks)

OR

- 4 a. Obtain the expression for current shared by two transformers with unequal voltage ratios connected in parallel. The transformers have unequal impedances. Also draw the phaser diagram. (10 Marks)
- b. With a neat diagram show the current distribution in step up and step down auto transformer. Also derive the expression for series...

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

Module-3

- 5 a. What is cooling of transformer? List different methods of cooling and explain any of them. (06 Marks)
 b. Define armature reaction, with neat diagram explain armature reaction in DC generator. (08 Marks)
 c. Explain the procedure in obtaining equivalent circuit parameters for three winding transforms. (06 Marks)

OR

- 6 a. Derive EMF equation of an alternator. Also give the expression for pitch factor and distribution factor. (10 Marks)
 b. What is commutation? Explain the problems associated with commutation in DC generator and discuss the methods to overcome problems. (10 Marks)

Module-4

- 7 a. Define voltage regulation of the alternator and explain the ampere turn method of predetermination of regulation. (08 Marks)
 b. A 3-phase star connected synchronous generator supplies current of 10A having phase angle of 20° lagging at 400V. Find the load angle and components of armature current ' I_a ' and I_q if $X_d = 10\Omega$ and $X_d = 6.5\Omega$. Assume armature resistance to be negligible. (12 Marks)

OR

- 8 a. Explain the method of determining voltage regulation of alternator by MMF method with all necessary circuit diagrams in the test. (12 Marks)
 b. A 2300V, 50Hz, 3 ϕ star connected alternator has an effective armature resistance of 0.2Ω . A field current of 35A produces a current of 150A an short circuit and open circuit emf 780V (line) calculate the voltage regulation at 0.8pF lagging and 0.8pF leading for the full load current of 25A. (08 Marks)

Module-5

- 9 a. Mention the necessary condition for synchronization of alternators. Explain the lamp dark and lamp bright method of synchronization of alternators. (12 Marks)
 b. Write short notes on hunting in synchronous machine. Also explain the role of damper winding. (08 Marks)

OR

- 10 a. Write a note on capability curves of synchronous generator. (06 Marks)
 b. What is short circuit ratio? Explain the significance of SCR. (06 Marks)
 c. With a neat diagram, explain the method of determination of X_d and X_q of salient pole alternator. (08 Marks)

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18EE43

Fourth Semester B.E. Degree Examination, June/July 2023
Transmission and Distribution

Time: 3 hrs.

Max. Marks: 100

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

Module-1

- 1 a. With a neat sketch, explain typical alternating current power supply scheme. (06 Marks)
- b. Explain how importance of high voltage transmission on:
 - (i) Volume of conductor material
 - (ii) Transmission efficiency
 - (iii) Percentage of drop (06 Marks)
- c. Derive the expression for sag in an overhead line when supports are at unequal levels. (08 Marks)

OR

- 2 a. A overhead transmission line at a river crossing is supported from two towers at height of 40 m and 90 m above water level, the horizontal distance between the towers being 400 m. If the maximum allowable tension is 2000 kg. Find the clearance between the conductor and water at a point mid-way between the towers. (08 Marks)
- b. Derive the mathematical expression for voltages and efficiency in string of three insulators connected in series. (08 Marks)
- c. Write a note on lightning. (04 Marks)

Module-2

- 3 a. Explain: (i) Constants of a transmission line (ii) Skin effect (06 Marks)
- b. Two conductors of a single-phase line each of km diameter are arranged in a vertical plane with one conductor mounted 1 m above the other. A second identical line is mounted at the same height as the first and spaced horizontally 0.25 m apart from it. The two upper and the two lower conductors are connected in parallel. Determine the inductance per km of the resulting double circuit line. (08 Marks)
- c. Write a short note on Muthal GMD. (06 Marks)

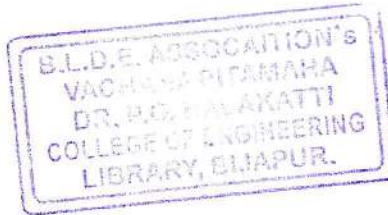
OR

- 4 a. Explain the flux linkages in parallel current carrying conductors. (04 Marks)
- b. Derive the expression for inductance of a three phase symmetrically placed transmission line. (08 Marks)
- c. Derive the expression for capacitance of a single phase transmission line. (08 Marks)

Module-3

- 5 a. A 3 phase, 50 Hz, 150 km line has a resistance inductive reactance and capacitive shunt admittance of 0.1Ω , 0.5Ω and $3 \times 10^{-6} \text{ s}$ per km per phase. If the line delivers 50 MW at 110 KV and 0.8 p.f. lagging. Determine the sending end voltage and current. Assume a nominal π circuit for the line. (08 Marks)
- b. Derive an expression for sending end voltage and current for long transmission line using rigorous solution. (12 Marks)

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



18EE43

OR

- 6 a. An overhead three phase short transmission line delivers 5000 KW at 22 KV at 0.8 power factor lagging. The resistance and reactance of each conductor is 4Ω and 6Ω respectively. Determine:
- (i) Sending end voltage
 - (ii) Percentage regulation
 - (iii) Transmission efficiency
- (08 Marks)
- b. Discuss the nominal T method of medium transmission line with appropriate phasor diagram and hence obtain the expressions for regulations and ABCD constants for the same. (08 Marks)
- c. Two transmission lines having generalized circuit constants A_1, B_1, C_1, D_1 and A_2, B_2, C_2, D_2 are connected in series. Develop the expressions for the constants ABCD. (04 Marks)

Module-4

- 7 a. Explain the factors affecting corona. (04 Marks)
- b. A single-core cable has a conductor diameter of 1 cm and insulation thickness of 0.4 cm. If the specific resistance of insulation is $5 \times 10^{14} \Omega\text{cm}$. Calculate the insulation resistance for a 2 km length of the cable. (06 Marks)
- c. What are the methods of grading cables? Describe the potentials in capacitance grading. (10 Marks)

OR

- 8 a. Discuss the construction of underground cable. (06 Marks)
- b. Explain the comparison between underground and overhead lines. (08 Marks)
- c. List the advantages and disadvantages of corona. (06 Marks)

Module-5

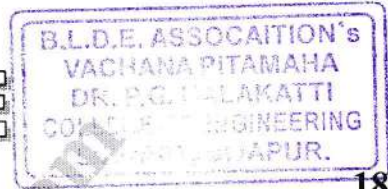
- 9 a. What are the limitations in distribution systems? (06 Marks)
- b. Explain in detail the reliability aids. (10 Marks)
- c. Describe radial distribution system. (04 Marks)

OR

- 10 a. Explain A.C distributor with concentrated loads. (08 Marks)
- b. Explain 3-phase four wire star connected unbalanced loads for A.C. distribution system. (06 Marks)
- c. Explain the types of variations in power quality. (06 Marks)

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18EE44

Fourth Semester B.E. Degree Examination, June/July 2023 Electric Motors

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 principles of torque production in DC motor and derive the torque equation of a DC motor and explain various types of torque in DC motor. (10 Marks)
- b. Briefly explain the various losses that occur in DC machine. Draw the power flow diagram of a DC motor and derive the condition for maximum efficiency. (10 Marks)

OR

- 2 a. What is the necessity of starter? Explain with a neat diagram, the operation of 3 point starter. (10 Marks)
- b. A 230V DC shunt motor runs at 800 rpm and takes armature current of 50A. Find the resistance to be added to the field circuit to increase the speed from 800 rpm to 1000 rpm at an armature current of 80A. Assume flux is proportional to field current, Armature resistance is 0.15Ω and field resistance is 250Ω . (10 Marks)

Module-2

- 3 a. With neat circuit diagram, explain Swinburne's test on DC motor. Show how the η of motor can be predetermined. Mention the merits and demerits of this test. (10 Marks)
- b. Hopkinson's test is conducted on two DC shunt machines. The supply current is 15A at 200V. The generator O/P current is 85A. The field current of motor and generator are 2.5A and 3A respectively. The armature resistance of each machine is 0.05Ω . Find the efficiency of each machine on load. (10 Marks)

OR

- 4 a. Discuss the torque – slip characteristics of 3ϕ induction motor including motoring, generating and braking regions. (10 Marks)
- b. A 400V, 4 pole, 3 phase, 150 Hz star-connected induction motor has rotor resistance and reactance per phase equal to 0.01Ω and 0.1Ω respectively. Determine i) Starting torque ii) Slip at which maximum torque will occur iii) Speed at which maximum torque will occur iv) Maximum torque v) Full load torque if full load slip is 4%. Assume ratio of stator to rotor turns as 4. (10 Marks)

Module-3

- 5 a. Explain No load test and Blocked rotor test in a 3 phase induction motor. How are the parameters of equivalent circuit determined from test results? (10 Marks)
- b. A 25KW, 4 pole 3ϕ , 50Hz induction motor is running at 1410 rpm, supplying full load. The mechanical losses are 850W and stator losses are 1.7 times rotor copper losses on full load. Calculate i) Gross mechanical power developed ii) Rotor copper losses iii) The value of rotor resistance / phase if rotor current on full load / phase is 65A. iv) Full load efficiency. (10 Marks)

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

OR

- 6 a. Explain with a neat circuit diagram, the construction and operation of a double cage induction motor. Draw the equivalent circuit and speed torque characteristics. (10 Marks)
- b. The power input to the rotor of a 440V, 50Hz, 3 phase, 6 pole induction motor is 60KW. It is observed that rotor emf makes 90 complete cycle / minute. Calculate
i) Slip ii) Rotor copper loss iii) Mechanical power developed. (10 Marks)

Module-4

- 7 a. Mention the different methods of speed control of 3 phase induction motor. Describe any two methods. (10 Marks)
- b. Justify the necessity of starter for 3 phase induction motor and hence explain Star – delta starter. (10 Marks)

OR

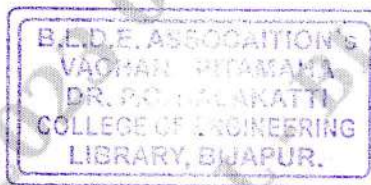
- 8 a. Why single phase induction motor is not self starting? Explain the principle of operation of single phase induction motor using double revolving field theory. (10 Marks)
- b. Explain the Construction and Operation of:
i) Capacitor start single phase induction motor.
ii) Capacitor start, capacitor run single phase induction motor. (10 Marks)

Module-5

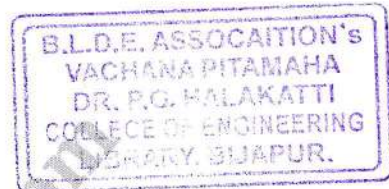
- 9 a. Explain the operation of synchronous motor at constant load and variable excitation with phasor diagram. (10 Marks)
- b. Briefly explain V and inverted V curves of synchronous motor. (10 Marks)

OR

- 10 a. Explain the construction, working, characteristics and application of AC servomotor. (10 Marks)
- b. Explain the principle of operation of linear induction motor and draw its characteristics. List some applications of it. (10 Marks)



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18EE45

Fourth Semester B.E. Degree Examination, June/July 2023 Electromagnetic Field Theory

Time: 3 hrs.

Max. Marks: 100

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

Module-1

- a. Define the following:
(i) Scalar and Vector (ii) Dot product and cross product
(iii) Divergence (iv) Curl (08 Marks)
- b. State and explain Coulomb's law of force between two point charges in vector form. (06 Marks)
- c. Explain electric field intensity at a point due to a point charge. (06 Marks)

OR

- a. The flux density $\vec{D} = -\frac{1}{3} a_r \text{ nc/m}^2$ is in free space. Find:
(i) \vec{E} at $r = 0.2 \text{ m}$
(ii) Find the total electric flux leaving sphere of $r = 0.2 \text{ m}$.
(iii) Find the total charge within the sphere of $r = 0.3 \text{ m}$. (10 Marks)
- b. Given $\vec{D} = 5r a_r \text{ c/m}^2$, prove divergence theorem for a shell region enclosed by spherical surfaces at $r = a$ and $r = b$ ($b > a$) and centred at the origin. (10 Marks)

Module-2

- a. Obtain an expression for the workdone in moving a point charge 'Q' in an electric field \vec{E} . (08 Marks)
- b. Show that $\vec{E} = -\nabla V$ i.e. electric field intensity is negative gradient of potential. (06 Marks)
- c. Obtain the equation of continuity in both integral and differential form. (06 Marks)

OR

- a. Explain and derive the boundary conditions for a conductor dielectric interface. (10 Marks)
- b. The capacitance of the condenser formed by the two parallel metal sheets, each 100 cm^2 in area separated by a dielectric 2 mm thick is $2 \times 10^{-4} \mu\text{F}$. A potential of 20 KV is applied to it. Find:
(i) Electric flux
(ii) Potential gradient in KV/m
(iii) The relative permittivity of the material
(iv) Electric flux density (10 Marks)

Module-3

- a. From the Gauss's law, derive Poisson's and Laplace's equation and write Laplace's equation in Cartesian, cylindrical and spherical coordinate systems. (10 Marks)
- b. State and prove Uniqueness theorem. (05 Marks)
- c. There exists a potential of $V = -2.5$ Volts on a conductor at 0.02 m and $V = 15$ Volts at $r = 0.35$ m. Determine E and D by solving the Laplace's equation in spherical coordinates representing the potential system. (05 Marks)

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



18EE45

OR

- 6 a. State and explain Biot-Savart's law. (08 Marks)
b. State and prove Ampere's circuital law. (08 Marks)
c. Define magnetic field and state its properties. (04 Marks)

Module-4

- 7 a. Derive Lorentz Force Equation. (08 Marks)
b. A point charge of $Q = -40 \mu\text{C}$ is moving with a velocity of $\vec{V} = (-3\vec{a}_x - 4\vec{a}_y + 4.5\vec{a}_z) \times 10^6$ m/sec. Find the magnitude of the vector force exerted on the moving particle by the field:
(i) $\vec{B} = 2\vec{a}_x - 3\vec{a}_y + 5\vec{a}_z$ mT
(ii) $\vec{E} = (2\vec{a}_x + 3\vec{a}_y - 4\vec{a}_z)$ KV/m
(iii) Both \vec{B} and \vec{E} active together. (06 Marks)
c. Derive an expression for magnetic force due to magnetic field \vec{B} on a conductor of length 'L' metre. (06 Marks)

OR

- 8 a. Find the force per meter length between two long parallel wires separated by 10 cm in air and carrying a current of 10 A in same direction. (06 Marks)
b. Derive an equation for the magnetic force between two differential current elements. (08 Marks)
c. A loop has a dimension of 1m \times 2m and lies in the uniform magnetic field, $\vec{B}_0 = -0.6\vec{a}_y + 0.8\vec{a}_z$ T. The loop current is 4 mA. Calculate the torque on the loop. (06 Marks)

Module-5

- 9 a. List Maxwell's equations for steady and time varying fields in point form and integral form. Also mention the relevant laws. (10 Marks)
b. Show that the ratio of the amplitudes of conduction current density and displacement current density is $\frac{\sigma}{\omega\epsilon}$. (10 Marks)

OR

- 10 a. Starting from Maxwell's equations, obtain the general wave equations in electric and magnetic fields. (10 Marks)
b. The magnetic field intensity of uniform plane wave in air is 20 A/m in \vec{a}_y direction. The wave is propagating in \vec{a}_z direction at an angular frequency of 2×10^9 rad/sec. Find:
(i) Phase shift constant
(ii) Wavelength
(iii) Frequency
(iv) Amplitude of electric field intensity (10 Marks)

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Fourth Semester B.E. Degree Examination, June/July 2023 Operational Amplifiers and Linear ICs

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) Bandwidth
ii) CMRR
iii) Slewrate
iv) Input offset voltage. (08 Marks)
- b. Mention the ideal characteristics of Op-Amp. (06 Marks)
- c. Draw the block diagram of Op-Amp and explain. (06 Marks)

OR

- 2 a. Derive an expression for the output of three inputs inverting amplifier and averaging amplifier. (12 Marks)
- b. Determine the value of all the components to design a peaking amplifier with a gain of 18 at a frequency of 25kHz. (06 Marks)
- c. Mention the good instrumentation amplifier requirements. (02 Marks)

Module-2

- 3 a. Compare an Active filter and Passive filter. (06 Marks)
- b. With a neat circuit diagram, explain second order low pass Butterworth filter. Derive the expression for the gain of the filter. (10 Marks)
- c. What are the advantages of active filter over the passive filter? (04 Marks)

OR

- 4 a. Define voltage regulator. With a neat block diagram, explain the regulated power supply. (12 Marks)
- b. With a neat circuit diagram, explain voltage follower regulator using Op-Amp. (08 Marks)

Module-3

- 5 a. With the neat circuit diagram, explain operation of triangular wave generator using Op-Amp. (06 Marks)
- b. Explain the operation of RC-Phase shift oscillator using Op-Amp. (08 Marks)
- c. Draw the circuit of an output stage for controlling the output amplitude and DC voltage level of a signal generator. Explain the operation. (06 Marks)

OR

- 6 a. Explain with the neat circuit diagram and waveform, the operation of inverting and non inverting zero crossing detector. (10 Marks)
- b. Comparison between Schmitt trigger and comparator. (06 Marks)
- c. For a non inverting regenerative comparator $R_1 = 100K\Omega$, $R_2 = 1K\Omega$ and $V_{sat} = \pm 13.5V$. Calculate tripping voltage. (04 Marks)

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

Module-4

- 7 a. What is precision rectifier? Draw and explain the operation of full wave precision rectifier using Op-Amp. (10 Marks)
- b. Explain the half wave precision rectifier clipper circuit using Op-Amp. (10 Marks)

OR

- 8 a. Define the following terms of D/A converter:
- Resolution
 - Accuracy
 - Monotonicity
 - Conversion time
 - Stability.
- b. With a neat diagram, explain the working of R-2R ADC. (10 Marks)

Module-5

- 9 a. What is PLL? With neat diagram explain the PLL. (08 Marks)
- b. Define lock range, capture range and pull in time for PLL. (06 Marks)
- c. Explain how XOR gates can be used as phase detector in PLL. (06 Marks)

OR

- 10 a. Explain the basic working principle of timer circuit. (10 Marks)
- b. With a neat circuit diagram, explain astable multivibrator using IC555. (10 Marks)



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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 $w = z + \frac{1}{z}, z \neq 0$. (06 Marks)
- b. Find the Bilinear transformation which maps the points $z = 1, i, -1$ onto $w = 0, 1, \infty$. (07 Marks)
- c. Evaluate $\int_0^{2+i} (\bar{z})^2 dz$ 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 $f(a) = \frac{1}{2\pi i} \int_C \frac{f(z)}{(z-a)} dz$. (07 Marks)
- c. Evaluate using Cauchy's integral formula.
 $\int_C \frac{e^{2z}}{(z-1)(z-2)} dz$ $C: |z| = 3$. (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)

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

OR

- 6 a. 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 $\tan \theta = \frac{\sigma_x}{\sigma_x^2 + \sigma_y^2} \left(\frac{1-r^2}{r} \right)$.

Indicate the significance of the cases $r = 0$ and $r = \pm 1$.

(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 $\chi_{0.05}^2 = 16.92$ 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 chosen 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)**

CBCS SCHEME

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21EE44

Fourth Semester B.E. Degree Examination, June/July 2023 Electric Motors

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 meant by Back emf? Explain the significance of Back emf. (06 Marks)
b. Sketch and explain the speed-current, speed-torque and torque-current characteristics of a shunt motor. (06 Marks)
c. A series motor having resistance of 1Ω between its terminals drives a fan, the torque of which is proportional to the square of the speed. At 230V, its speed is 300rpm and takes 15A. The speed of the fan is to be raised to 375rpm by supply voltage control estimate the supply voltage required. (08 Marks)

OR

- 2 a. Derive an expression for torque of a DC motor. (06 Marks)
b. Briefly explain the necessary of starter to start DC Motor and with a neat diagram explain the operation of 3 point starter. (08 Marks)
c. A 200 V shunt motor has $R_a = 0.1\Omega$ and $R_{sh} = 240\Omega$ and rotational loss 236w. On full load the line current is 9.8 with motor running at 1450 rpm.
Determine :
i) Mechanical power developed
ii) The power output
iii) The full load efficiency. (06Marks)

Module-2

- 3 a. With a neat circuit diagram explain the retardation test conducted on DC shunt motor and show how the stray losses are determined with and without flywheel. (10 Marks)
b. A test on two coupled similar tramway motors, with their field connected in series, gave following results when one machine acted as a motor and the other as a generator, calculate the efficiency of motor and generator.
Motor : Armature current : 56A
Armature voltage : 590V
Voltage drop across field winding : 40V
Generator : Armature current : 44A
Armature voltage : 400V
Field winding drop : 40V
Resistance of each armature : 0.3Ω . (10 Marks)

OR

- 4 a. Derive the torque equation for three phase IM and derive condition for maximum torque. (08 Marks)
b. Sketch and explain the typical torque – slip characteristics of a three phase IM. (04 Marks)
c. A 12-pole, 50Hz, 3ϕ IM has rotor resistance of 0.15Ω and standstill reactance of 0.25 per phase. On full load it is running at a speed of 480rpm. The rotor induced emf per phase at standstill is observed to be 32V. Calculate :
i) Starting torque
ii) Full load torque

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

Module-3

- 5 a. Draw and explain the phasor diagram of 3-phase IM under loaded condition. (06 Marks)
 b. Draw the power flow diagram of a 3-phase IM and explain. (06 Marks)
 c. A 6 pole, 3-phase IM develops 30hp including mechanical losses of 2hp at a speed of 950rpm on 550V, 50Hz supply. Calculate for this load :
 i) The slip ii) The rotor Cu loss iii) Total input if the stator losses are 2000 watts. (08 Marks)

OR

- 6 a. Explain the operation of deep bar rotor IM along with the equivalent circuit diagram and also draw its torque – slip characteristics. (08 Marks)
 b. Draw the circle diagram for a 20HP, 50Hz, 3-phase, star connected IM with the following data :
 No load test : 400V, 9A, 0.2pf lagging
 Blocked rotor test : 200V, 50A, 0.4pf lagging
 Determine the line current and efficiency for FL condition from circle diagram. (12 Marks)

Module-4

- 7 a. Explain the necessity of a starter to start 3-phase IM and with a neat sketch explain the operation of star-Delta Starter and rotor resistance starter. (10 Marks)
 b. Enumerate the speed control methods of 3 ϕ IM and explain any two methods in detail. (10 Marks)

OR

- 8 a. Explain double field revolving theory as applied to a single phase IM and prove that it cannot produce any starting torque. (08 Marks)
 b. With neat sketch explain the construction and working of capacitor start single phase IM. (08 Marks)
 c. Write a note on limitations and application of shaded pole IM. (04 Marks)

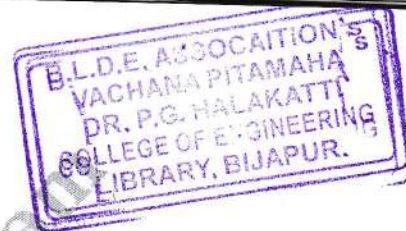
Module-5

- 9 a. List the methods of starting synchronous motor explain any one method with neat sketch. (08 Marks)
 b. Describe a phenomenon of hunting in synchronous machine and methods to overcome this. (06 Marks)
 c. What is synchronous condenser? What is its application? (06 Marks)

OR

- 10 a. Briefly explain the V and inverted V curves of a synchronous motors and the methods of obtaining them. (08 Marks)
 b. Explain the construction and working of Chiversal motor and steeper motor. (12 Marks)

CBCS SCHEME



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21MATCS41

Fourth Semester B.E. Degree Examination, June/July 2023 Mathematical Foundations for Computing, Probability and Statistics

Time: 3 hrs.

Max. Marks: 100

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

Module-1

- Define tautology. Determine whether the following compound statement is a tautology or not: $\{(p \vee q) \rightarrow r\} \leftrightarrow \{\neg r \rightarrow \neg(p \vee q)\}$ (06 Marks)
 - Determine whether the following argument is valid or not : (07 Marks)
No engineering student of I & II semester studies logic
Anil is an engineering student who studies logic
 \therefore Anil is not in II semester.
 - Give direct proof and proof by contradiction for the statement "If n is an odd integer then $n + 9$ is an even integer." (07 Marks)

OR

- Prove that the argument given below is a valid argument: (06 Marks)
$$\begin{array}{l} p \rightarrow (q \rightarrow r) \\ \sim q \rightarrow \sim p \\ \hline p \\ \hline \therefore r \end{array}$$
 - Prove that $[\sim p \wedge (\sim q \wedge r)] \vee [(q \wedge r) \vee (p \wedge r)] \leftrightarrow r$ by using laws of logic. (07 Marks)
 - Give a direct proof for each of the following. For all integers K and l , if K and l are both even, then (i) $K + l$ is even (ii) Kl is even (07 Marks)

Module-2

- Consider $f : \mathbb{R} \rightarrow \mathbb{R}$ defined by $f(x) = 2x + 5$ and $g : \mathbb{R} \rightarrow \mathbb{R}$ defined by $g(x) = \frac{1}{2}(x - 5)$. Prove that g is an inverse of f . (06 Marks)
 - Let $A = \{1, 2, 3, 4, 6\}$ and R be a relation on A defined by aRb if and only if "a is a multiple of b". Write down the relation R , relation matrix $M(R)$ and draw its diagram. (07 Marks)
 - Define: (i) Simple graph (ii) Complete graph (iii) Subgraph (iv) Spanning subgroup (07 Marks)

OR

- Let f and g be functions from \mathbb{R} to \mathbb{R} defined by $f(x) = ax + b$ and $g(x) = 1 - x + x^2$, if $(g \circ f)(x) = 9x^2 - 9x + 3$, determine a and b . (06 Marks)
 - Let $A = \{1, 2, 3, 4\}$, $R = \{(1, 3), (1, 1), (3, 1), (1, 2), (3, 3), (4, 4)\}$ be a relation on A . Determine whether the relation R is reflective, symmetric, anti-symmetric or transitive. Hence verify R is an equivalence relation or not. (07 Marks)

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

- c. Define isomorphism of graph. Find whether the following graphs are isomorphic or not.

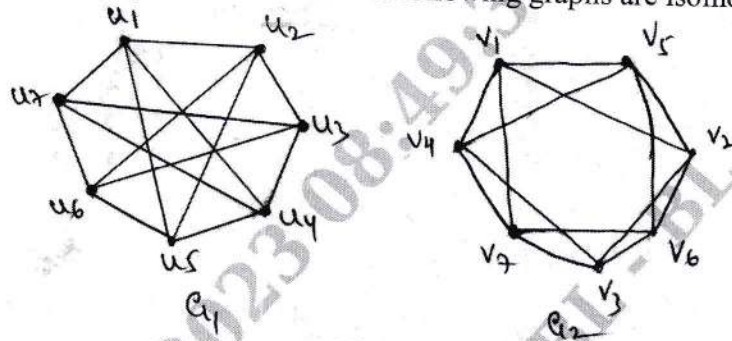


Fig.Q4(c)

(07 Marks)

Module-3

- 5 a. Fit a second degree parabola $y = a + bx + cx^2$ in the least square sense for the following data:

x	0	1	2	3	4
y	1	1.8	1.3	2.5	2.3

- b. Obtain the lines of regression and hence find the coefficient of correlation for the data: (06 Marks)

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

- c. The following are the percentage of marks in matrix (x) and statistics (y) of nine students. Calculate the rank correlation coefficient. (07 Marks)

x	38	50	42	61	43	55	67	46	72
y	41	64	70	75	44	55	62	56	60

(07 Marks)

OR

- 6 a. Fit a least square geometric curve $y = ax^b$ for the data:

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

- b. Given the equation of the regression lines $x = 19.13 - 0.874y$, $y = 11.64 - 0.5x$. Compute the mean of x, y and the coefficient of correlation. (06 Marks)

- c. Three judges A, B, C, give the following ranks. Find which pair of judges has common approach. (07 Marks)

A	1	6	5	10	3	2	4	9	7	8
B	3	5	8	4	7	10	2	1	6	9
C	6	4	9	8	1	2	3	10	5	7

(07 Marks)

Module-4

- 7 a. A random variable x has the following probability distribution:

x	0	1	2	3	4	5	6	7
P(x)	0	K	2K	3K	3K	K ²	2K ²	7K ² +K

- (i) Find K (ii) Find $P(x < 6)$, $P(x \geq 6)$ and $P(3 < x \leq 6)$

(06 Marks)

- b. Derive the mean and standard deviation of binomial distribution. (07 Marks)

(07 Marks)

- c. In a test on electric bulbs, it was found that the life time of a particular brand was distributed normally with an average life of 2000 hours and SD. of 60 hours. If a firm purchases 2500 bulbs, find the number of bulbs that are likely to last for (i) more than 2100 hours (ii) less than 1950 hours (iii) between 1900 to 2100 hours. $A(1.67) = 0.4525$, $A(0.83) = 0.2967$, $A(1.67) = 0.4525$. (07 Marks)

OR

- 8 a. In a quiz contest of answering 'Yes' or 'No', what is the probability of guessing atleast 6 answers correctly out of 10 questions asked? Also find the probability of the same if there are 4 options for a correct answer? (06 Marks)
- b. The number of accidents in a year to taxi drivers in a city follows a Poisson distribution with mean 3. Out of 1000 taxi drivers find approximately the number of the drivers with : (i) no accident in a year (ii) more than 3 accidents in a year. (07 Marks)
- c. In a normal distribution 31% of the items are under 45 and 8% of the items are over 64. Find the mean and S.D. of the distribution. $A(0.5) = 0.1915$, $A(1.4) = 0.4192$. (07 Marks)

Module-5

- 9 a. The joint distribution of two random variables x and y as follows:

	Y	-4	2	7
X				
1		$\frac{1}{8}$	$\frac{1}{4}$	$\frac{1}{8}$
2		$\frac{1}{4}$	$\frac{1}{8}$	$\frac{1}{8}$

- Find: $E(X)$, $E(Y)$ and $E(XY)$ (ii) $cov(X, Y)$ (iii) $\rho(X, Y)$ (06 Marks)
- b. A die is thrown 9000 times and a throw of 3 or 4 was observed 3240 times. Show that the die cannot be regarded as an unbiased one. (07 Marks)
- c. A certain stimulu administered to each of the 12 patients resulted in the following changes of blood pressure. 5, 2, 8, -1, 3, 0, 6, -2, 1, 5, 0, 4. Can it be concluded that the stimulus will increase the blood pressure, ($t_{0.05} = 2.201$ for 11 d.f) (07 Marks)

OR

- 10 a. A fair coin is tossed thrice. The random variables X and Y are defined as follows:
X = 0 or 1 according as head or tail occurs in first toss.
Y = Number of heads.
(i) Determine the distribution of X and Y. (06 Marks)
(ii) Determine the joint distribution of X and Y.
- b. Explain: (i) Null hypothesis (ii) Significance level (iii) Type I and Type II Errors (07 Marks)
- c. Five dice were thrown 96 times and the numbers 1, 2 or 3 appearing on the face of the dice follows the frequency distribution as below :

Number of dice showing 1, 2 or 3	5	4	3	2	1	0
Frequency	7	19	35	24	8	3

Test the hypothesis that the data follows a binomial distribution. ($\chi_{0.05}^2 = 11.07$ for 5 d.f.)

(07 Marks)

CBCS SCHEME

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Question Paper Version : D

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

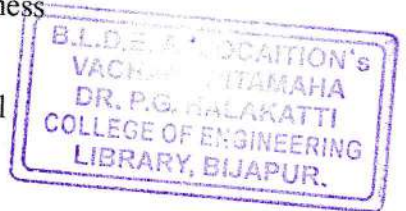
Time: 1 hr.]

[Max. Marks: 50

INSTRUCTIONS TO THE CANDIDATES

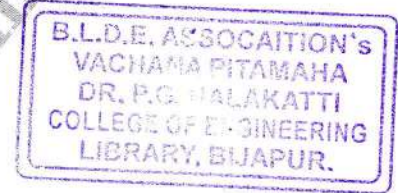
1. Answer all the **fifty** questions, each question carries one mark.
2. Use only **Black ball point pen** for writing / darkening the circles.
3. **For each question, after selecting your answer, darken the appropriate circle corresponding to the same question number on the OMR sheet.**
4. Darkening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

1. Comprehensive human goal at the level of individual
 - a) Prosperity
 - b) Fearlessness
 - c) Co-existence
 - d) Right understanding
2. The fourth order of nature is
 - a) Material
 - b) Bio order
 - c) Animal order
 - d) Human order
3. _____ is the basic unit of human society.
 - a) Group
 - b) Individual
 - c) Nature
 - d) Society
4. Which of the following is a positive value?
 - a) Self respect
 - b) Anger
 - c) Fear
 - d) Narrow mindedness
5. What is the nature of self?
 - a) Conscious
 - b) Physio-Chemical
 - c) Biochemical
 - d) Semi-Conscious
6. Self exploration is seeing beyond
 - a) Universe
 - b) House
 - c) Box
 - d) Your senses
7. Human to human interaction is called as
 - a) Work
 - b) Behaviour
 - c) System
 - d) None of these
8. "All are our own, all are interconnected, interdependent" means.
 - a) Oneness
 - b) Worship
 - c) Ease
 - d) None of these
9. 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) Deprived of physical facility



10. Realization is the activity of
 a) Self
 b) Body
 c) Both self and Body
 d) None of these
11. The feelings for those who have made effort for my excellence is _____
 a) Excellence
 b) Reverence
 c) Gratitude
 d) Glory
12. There are _____ comprehensive human goals
 a) Eight (8)
 b) Six (6)
 c) Four (4)
 d) Nine (9)
13. The first order of nature is _____
 a) Material order
 b) Bio order
 c) Animal order
 d) Human order
14. Developing ethical competence in the profession is the only effective way to ensure
 a) Responsibilities
 b) Ethics
 c) Profession
 d) Professional ethics
15. 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
16. 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
17. The human goal at the level of family is
 a) Prosperity
 b) Fearlessness
 c) Co-existence
 d) Right understanding
18. Sah-astitua means _____
 a) Co-existence
 b) Co-operation
 c) Co-option
 d) Corporate identity
19. Acceptance of excellence in others is called
 a) Reverence
 b) Guidance
 c) Glory
 d) Gratitude
20. Each human being is co-existence of
 a) Spirit and Sanyam
 b) Health and prosperity
 c) Self and Body
 d) Mind and Soul
21. Who is responsible for happiness and unhappiness?
 a) Self
 b) Body
 c) Outside situation
 d) Society
22. 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

23. Undivided society is ensured by
 a) Right understanding
 b) Physical facilities
 c) Relationship with right understanding
 d) None of these
24. The third order of nature is _____
 a) Material order
 b) Bio order
 c) Animal order
 d) Human order
25. Which is the complete value?
 a) Love
 b) Respect
 c) Trust
 d) Care
26. Body is a _____ unit while the self is a _____ unit.
 a) Material, Consciousness
 b) Consciousness, Material
 c) Material, Material
 d) Consciousness, Consciousness
27. Society is an extension of _____
 a) Human Being
 b) Family
 c) Nature
 d) Existence
28. In value education Sanyam mans _____
 a) Self-exploration
 b) Self-evolution
 c) Self-regulation
 d) None of these
29. To fulfill human aspirations _____ are necessary
 a) Both values and skills
 b) Values
 c) Skills
 d) None of these
30. The innateness of Bio order is _____
 a) Existence
 b) Cruelty / Non-cruelty
 c) Growth
 d) Nurture / Worsen
31. 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
32. 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
33. "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
34. 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
35. Understanding of human values leads to the practice of
 a) Responsibilities
 b) Ethics
 c) Profession
 d) Professional ethics
36. "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



37. Education-Right living leads to _____
 a) Right understanding
 c) Doubts
 b) Confusions
 d) None of these
38. There are _____ dimensions of living
 a) Six (6) b) Four (4) c) Nine (9) d) Five (5)
39. The second order of nature is _____
 a) Material order
 c) Animal order
 b) Bio order
 d) Human order
40. The innateness of material order is _____
 a) Existence
 c) Growth
 b) Cruelty/Non-cruelty
 d) Nurture/Worsen
41. Harmony should be maintained in
 a) Between body and life
 c) Between life and environment
 b) Between self and society
 d) All of these
42. Basic human aspirations are
 a) Continuous Happiness
 c) Both a and b
 b) Prosperity
 d) None of these
43. Purpose of value education is
 a) Foster universal core values
 c) Develop values in individuals
 b) Make the syllabus easy
 d) All of these
44. Knowing means having the
 a) Self exploration
 c) Right understanding
 b) Self evaluation
 d) Having knowledge of all
45. 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
46. _____ is called foundation value
 a) Respect b) Affection c) Love d) Trust
47. The Human goal at the level of nature is
 a) Prosperity
 c) Co-existence
 b) Fearlessness
 d) Right understanding
48. The outcome of justice is _____
 a) Right understanding
 c) Trust and Fearlessness
 b) Prosperity
 d) Coexistence with nature
49. Society means
 a) Family
 c) Few individuals
 b) All human beings
 d) None of these
50. Feeling for those who have made effort for excellence is _____
 a) Excellence
 c) Glory
 b) Reverence
 d) None of these

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18EE52

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

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 the need of stack memory in microcontroller? How stack is operated in 8051 microcontroller? (10 Marks)
- b. Explain the different addressing modes of 8051 with an example. (10 Marks)

OR

- 2 a. Describe the bit pattern of Program Status Word (PSW). (06 Marks)
- b. Explain the memory organization of 8051. (07 Marks)
- c. Discuss the working of 8051 microcontroller with the help of block diagram. (07 Marks)

Module-2

- 3 a. Explain the unconditional jump instruction with address range. (08 Marks)
- b. Describe the following instructions with an example for each:
 (i) XCHD A, @R₀ (ii) MOVC A, @A + PC (iii) SWAPA
 (iv) MOV A, @R₁ (v) DAA (vi) ADDC A, @R₀ (12 Marks)

OR

- 4 a. Write an assembly language program to convert ASCII number to BCD number. (05 Marks)
- b. Analyze the following instructions and write the comment line for each?

```
MOV A, #85H
RR A
XCH A, R0
ADD A, R0
SWAP A
```

 (05 Marks)
- c. Explain PUSH and POP instructions with an example. (10 Marks)

Module-3

- 5 a. Explain the different data types supported by 8051C microcontroller. (08 Marks)
- b. Describe the significance of TMOD instruction in detail. (08 Marks)
- c. Write a 8051 ALP program to complement bit P_{1.5} ON and OFF 10000 times. (04 Marks)

OR

- 6 a. Write an ALP to create a square wave of 100 Hz with a duty cycle of 80% on port 1. Use timer '0', and operate that timer 0 in mode 1. Assume crystal frequency as 12 MHz. (10 Marks)
- b. A switch is connected to PM P_{1.2}. Write on 8051 C program to monitor 'SW' and create the following frequencies on P_{1.7}.
 SW = 0; 500 Hz
 SW = 1; 750 Hz
 Use timer 0, mode 1 for both of them. Assume crystal frequency as 11.0592 MHz. (10 Marks)

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

Module-4

- 7 a. Explain the importance of TI and RI flags. (04 Marks)
 b. Describe simplex, half duplex and full duplex serial data transfer. (06 Marks)
 c. Write a C program to transfer the message "EXAM" serially at 9600 baud rate, 8 bit data and one stop bit continuously. (10 Marks)

OR

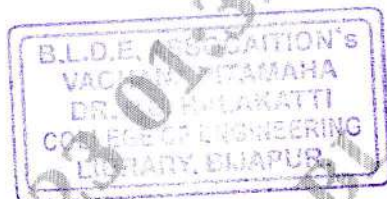
- 8 a. What is an interrupt? List various interrupts with their corresponding vector address. (06 Marks)
 b. Write a program to retrieve the data serially and put them in P₀. Set the baud rate at 4800, 8-bit and one stop bit. (06 Marks)
 c. Explain the asynchronous serial communication and data frame format. (08 Marks)

Module-5

- 9 a. Explain the architecture and working of LCD. Draw its schematic diagram. (10 Marks)
 b. Explain the construction and working of stepper motor. Also explain two phase, 4-step stepping sequence, step angle and steps per revolution. (10 Marks)

OR

- 10 a. Explain the control word format of 8255 IC. Find the control word for following configurations:
 (i) All ports of A, B and C are O/P ports (mode '0')
 (ii) PA = IN, PB = OUT, PCL = OUT and PCH = OUT (12 Marks)
 b. Explain the steps to interface ADC 0808 to the 8051 microcontroller with interfacing diagram. (08 Marks)



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

Time: 3 hrs.

Max. Marks: 100

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

Module-1

- 1 a. Explain the various types of power electronic converters with the help of circuit diagram, input and output waveforms. (10 Marks)
- b. With the help of suitable waveforms, explain the reverse recovery characteristics of power diode. Define reverse recovery time and derive equations for t_{rr} and I_{rr} . (10 Marks)

OR

- 2 a. With the help of circuit diagram and waveform, explain the single phase full wave rectifier with 'R' load. (06 Marks)
- b. With the help of circuit diagram and waveforms, Explain the operation of single phase diode rectifier feeding resistive load. Derive expression for average output voltage and rms value of output voltage. (10 Marks)
- c. The reverse recovery time of a diode is $3\mu s$ and rate of fall of current is $30A/\mu s$. Calculate:
i) Storage charge ii) Peak reverse current. (04 Marks)

Module-2

- 3 a. Explain steady state and switching characteristics of MOSFET. (08 Marks)
- b. Explain the anti saturation control of BJT with the help of suitable circuit diagram and equations. (06 Marks)
- c. Give a comparison between BJT, MOSFET and IGBT. (06 Marks)

OR

- 4 a. Explain the steady state and switching characteristics of BJT. (09 Marks)
- b. Explain the switching limits. (06 Marks)
- c. Explain the gate drive circuit of MOSFET with the help of circuit diagram. (05 Marks)

Module-3

- 5 a. Explain the V-I characteristics of SCR, with the help of graph indicating all necessary details. Also define: i) Latching current ii) Holding current. (08 Marks)
- b. Explain various method of turning on of a SCR. (06 Marks)
- c. Design a SCR triggering circuit using UJT. The parameters of UJT are $V_s = 30V$, $\eta = 0.66$, $I_p = 15\mu A$, $V_v = 3V$ and $I_v = 10mA$. The frequency of oscillations is $f = 500Hz$ and width of gate pulse if $t_g = 30\mu s$. Assume $V_D = 0.5V$ and $C = 0.5\mu F$. (06 Marks)

OR

- 6 a. Derive an expression for the anode current of SCR with the help of two transistor analogy. (06 Marks)
- b. Explain in brief why two thyristors of same rating when connected in parallel do not share equal currents. Suggest a method to equalize the currents and explain. (06 Marks)
- c. Explain UJT triggering circuit for full control of SCR with waveforms. (08 Marks)

Module-4

- 7 a. Explain the operation of single phase half wave rectifier with RLE load. Draw relevant circuit diagram and waveforms. (08 Marks)
- b. Explain the operation of single phase full wave ac voltage controller with inductive load. Draw the circuit diagram and waveforms. (06 Marks)
- c. A single phase fully controlled bridge rectifier circuit is used for obtaining a regulated dc output voltage. The rms value of the ac input voltage is 230V and firing angle is maintained at $\pi/3$. So that the load current is 4A. Calculate:
- DC output voltage
 - Active power output
 - Load resistance. (06 Marks)

OR

- 8 a. With the help of circuit diagram and waveforms, explain the working of integral cycle (on-off) control of ac voltage controller feeding resistive load. Derive an expression for rms output voltage. (08 Marks)
- b. With the help of suitable circuit and waveforms. Explain the working of single phase dual converter circulating current mode of operation. (07 Marks)
- c. Find the power consumed in the heater element if both SCRs are fired with delay angle of 45° for the Fig.Q.8(c). (05 Marks)

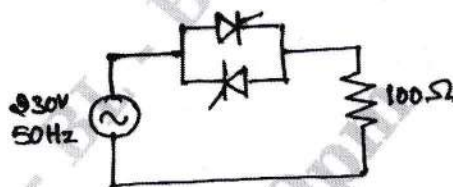


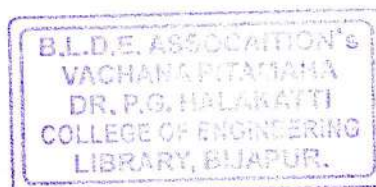
Fig.Q.8(c)

Module-5

- 9 a. With the help of schematic diagram and waveforms, explain the operation of step up chopper with RL load. Derive an expression for average output voltage. (08 Marks)
- b. Explain the working of single phase bridge inverter feeding resistive load. Draw the circuit diagram and waveforms. (06 Marks)
- c. A step up chopper has input voltage of 220V and output voltage of 660V. If the conducting time of chopper is $100\mu\text{s}$, calculate turn off time of output voltage. In case output voltage pulse width is halved for constant frequency operation, find the average value of new output voltage. (06 Marks)

OR

- 10 a. Explain the performance parameters of DC-DC converters. (06 Marks)
- b. Explain the construction and working of transistorized current source inverter. Draw the circuit diagram and waveforms. (08 Marks)
- c. The DC-DC converter has a resistive load of $R = 10\Omega$ and the input voltage is $V_s = 220\text{V}$. When the converter switch remains on, its voltage drop $V_{ch} = 2\text{V}$ and the chopping frequency is $f = 1\text{kHz}$. If the duty cycle is 50%. Calculate:
- Average output voltage
 - Rms output voltage
 - Converter efficiency. (06 Marks)



(06 Marks)

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18EE54

Fifth Semester B.E. Degree Examination, June/July 2023 Signals and Systems

Time: 3 hrs.

Max. Marks: 100

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

Module-1

- 1 a. Define signal and system. Explain real-life examples for each. (08 Marks)
- b. Prove that :
 - i) $\int_{-a}^a x(t)dt = 2 \int_0^a x(t)dt$; if $x(t)$ is even
 - ii) $\int_{-a}^a x(t)dt = 0$; if $x(t)$ is odd (12 Marks)

OR

- 2 a. Sketch the following elementary signals:

(i) Unit-step	(ii) Unit-Impulse function
(iii) Ramp-function	(iv) Exponential damped sinusoidal

(08 Marks)
- b. What is the average power of triangular wave shown in Fig.Q2(b)?

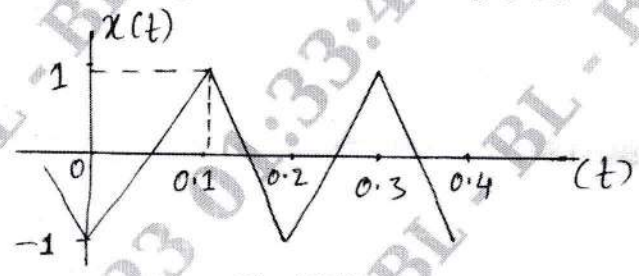


Fig.Q2(b) (12 Marks)

Module-2

- 3 a. Explain distributive property of convolution. (10 Marks)
- b. Find the forced response for the system described by

$$\frac{d^2 y(t)}{dt^2} + 5 \frac{dy(t)}{dt} + 6y(t) = 2x(t) + \frac{dx(t)}{dt} \quad \text{with input } x(t) = 2e^{-t}u(t) \quad (10 \text{ Marks})$$

Our answers, compulsorily draw diagonal cross lines on the remaining blank pages.
 Missing identification, appeal to evaluator and/or equations written eg, 42+8=50, will be treated as malpractice.
 Missing identification, appeal to evaluator and/or equations written eg, 42+8=50, will be treated as malpractice.

OR

- 6 a. State and prove Scaling property of CTFT. (10 Marks)
 b. Find the time-domain signal corresponding to the spectrum shown in Fig.Q6(b).

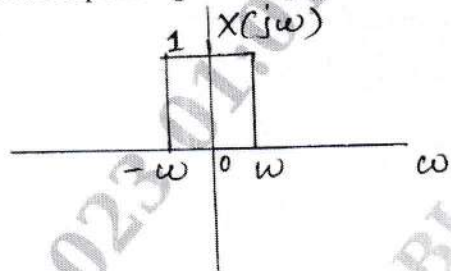


Fig.Q6(b) (10 Marks)

Module-4

- 7 a. State and prove frequency-differentiation property of DTFT. (10 Marks)
 b. Find the DTFT of the signal,
 $x(n) = \alpha^n u(n); |\alpha| < 1$
 Draw the magnitude spectrum. (10 Marks)

OR

- 8 a. State and prove symmetry property of DTFT. (10 Marks)
 b. Find the inverse DTFT of the following:
 i) $X(e^{j\Omega}) = 1 + 2 \cos \Omega + 3 \cos 2\Omega$
 ii) $Y(e^{j\Omega}) = j(3 + 4 \cos \Omega + 2 \cos 2\Omega) \sin \Omega$ (10 Marks)

Module-5

- 9 a. What are the properties of the region of convergence? (10 Marks)
 b. Determine the z-transform and ROC for the signal $x(n) = \left(\frac{1}{2}\right)^n u(n-2)$ and sketch the ROC, poles and zeros in the z-plane. (10 Marks)

OR

- 10 a. List the properties of Z-transform. (10 Marks)
 b. Find the inverse z-transform of

$$X(z) = \frac{z^3 + z^2 + \frac{3}{2}z + \frac{1}{2}}{z^3 + \frac{3}{2}z^2 + \frac{1}{2}z}; \text{ ROC: } |z| < \frac{1}{2}$$

by partial fraction expansion method. (10 Marks)

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Fifth Semester B.E. Degree Examination, June/July 2023 Electrical Machine Design

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 design factors to be considered for designing electrical machine. (08 Marks)
- b. Illustrate the classification of insulating materials based on thermal consideration as per IS 1271 – 1958. Give examples for each class. (12 Marks)

OR

- 2 a. Explain the limitations imposed during electrical machine design. (10 Marks)
- b. Explain the desirable properties of insulating material used in electrical machines. (05 Marks)
- c. Explain the types of magnetic materials used in electrical machine. (05 Marks)

Module-2

- 3 a. Derive the output equation of a DC machine. Explain the factors to be considered for the choice of specific loading, while designing DC machine. (10 Marks)
- b. Determine the main dimensions of the armature core, number of poles, number of commutator segments, number of slots for a 200KW, 300V, 300rpm, DC shunt generator with average flux density as 0.65T, ac/m as 43,000, the ratio of core length to pole pitch is 0.8 and efficiency is 91%. (10 Marks)

OR

- 4 a. Write the advantages of having large number of poles in DC machine. (06 Marks)
- b. A 5KW, 250V, 4 poles, 1500rpm, shunt generator is designed to have a square pole face. The loading are average flux density = 0.42wb/m², AC/m = 15,000. Find the main dimensions of the machine. Assume full load efficiency = 0.87 and ratio of pole arc to pole pitch = 0.66. (06 Marks)
- c. The outer cylindrical surface of a field coil can dissipate 0.1 watt/cm² of its area limited to an axial length of 20cm and as outside of 45cm. If the radial thickness of the coil is cm. Determine the ampere turns that can be accommodated with a terminal voltage of 50V. Take the resistivity of copper as 2 μΩ-cm and space factor as 0.6. (08 Marks)

Module-3

- 5 a. Derive expressions for output and emf per turn of a 3-phase are type transformer. (08 Marks)
- b. Calculate approximate overall dimensions of a 200KVA, 6600/440V, 50Hz, 3-phase are type transfer. The following data may be assumed flux density is 1.3wb/m², current density is 2.5A/mm² window space factor is 0.3, overall height is equal to overall width, k_i = 0.9, EMF/turn = 10V. Take a = 0.9d, A_i = 0.6d². Verify overall height is same as that of overall width of the transformer. (12 Marks)

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

OR

- 6 a. Derive an expression for the leakage reactance of a core type transformer. State clearly the assumptions made. (10 Marks)
- b. Design the suitable cooling tank for a 500KVA, 6600/440V, 50Hz, 3 ϕ core type transformer with the following data. The dimensions of transformer are 100cm height, 96cm length, 47cm width. Total losses = 7KW. Allow a temperature rise for tank wall as 55°C, 5cm diameter tubes are used. Determine the dimensions of the tank, number of tubes required and possible arrangement. (10 Marks)

Module-4

- 7 a. What are the factors to be considered for estimating the length of air gap for induction motor? (05 Marks)
- b. Derive the output equation for a 3-phase induction motor. (08 Marks)
- c. Explain the factors to be considered and guidelines for selecting the number of rotor slots. (07 Marks)

OR

- 8 a. Design a rotor for a 3-phase squirrel cage induction motor of 40HP, 50Hz, 6 pole, delta connected, having a full load efficiency of 87% and full load p.f of 0.85. The diameter of stator bore is 0.33m and length is 0.17m with 54 stator slots and 14 conductor per slot. Assume rotor mmf as 0.85 times the stator mmf and length of air gap as $l_g = 0.2 + 2\sqrt{DL}$. Assume current density as 4A/mm². (10 Marks)
- b. Design a suitable slip ring rotor for a 400HP, 2000V, 8 pole, 50Hz, 3 – phase, Delta connected induction motor. Take D = 74cm, L = 35 cm, number of stator slots as 96 with 14 conductors per slot. Efficiency = 93% p.f = 0.92. Take $m_2 = 3$ = rotor slots/pole/ph, voltage between slip ring be 600V, star connected. (10 Marks)

Module-5

- 9 a. Derive the output equation of a synchronous machine. Explain the factors to be considered for the choice of specific loading. (10 Marks)
- b. Determine the diameter and axial length of stator of a 3-phase, 250KVA, 1100 V, 50Hz, 12 pole synchronous generator. Assume specific magnetic loading as 0.6wb/m² and specific electric loading as 30,000 Ac/m. Take the ratio of length to pole pitch as 1.5. Also determine the number of stator conductors, number of stator slots and size of conductor. Assume current density as 3.5A/mm². (10 Marks)

OR

- 10 a. Define short circuit ratio for a synchronous machine. Explain its effect. (10 Marks)
- b. Calculate the main dimensions of a 1000 KVA, 50Hz, 3 – phase, 375 rpm alternator. The average air gap flux density is 0.55wb/m². AC/m is 28,000. Assume $K_w = 0.955$, ratio of core length to pole pitch as 2. Permitted maximum peripheral speed is 50m/sec. (10 Marks)

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Fifth Semester B.E. Degree Examination, June/July 2023 High Voltage Engineering

Time: 3 hrs.

Max. Marks: 100

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

Module-1

1.
 - a. Derive an expression for the current in the air gap, that is $I = I_0 e^{\alpha d}$, considering Townsend's first ionization coefficient. (08 Marks)
 - b. Mention the desired properties of gaseous dielectric for HV applications. Given any three examples of gaseous dielectric. (06 Marks)
 - c. In an experiment in a certain gas, it was found that the steady state current is 5.5×10^{-8} A at 8KV at a distance of 0.4cm between the plane electrodes, keeping the field constant and reducing the distance to 0.1cm results in a current of 5.5×10^{-9} A. Calculate Townsend's primary ionization coefficient α . If the break down occurred when the gap distance was increased to 0.9cm, what is the value of Townsend's secondary ionization coefficient γ . (06 Marks)

OR

2.
 - a. Explain the following breakdown mechanism in solid :
 - i) Electromechanical breakdown
 - ii) Thermal breakdown. (08 Marks)
 - b. State and explain Paschen's law. (06 Marks)
 - c. A solid dielectric specimen of dielectric constant of 4.0 shown in Fig.Q2(c) has an internal void of thickness 1mm. The specimen is 1cm thick and is subjected to a voltage of 80KV(RMS). If the void is filled with air and if the breakdown strength of air can be taken as 30KV(Peak)/cm, find the voltage at which an internal discharge can occur.

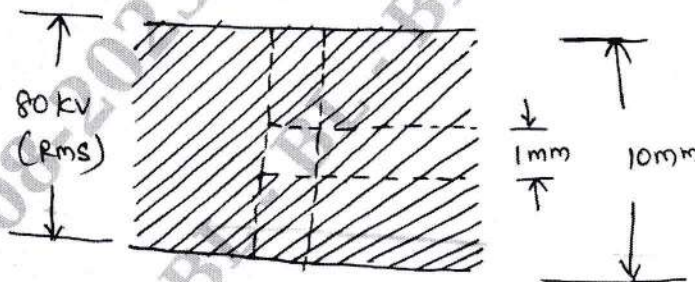


Fig.Q2(c)

(06 Marks)

Module-2

3.
 - a. Explain with a neat sketch, how 3-stage cascaded transformer generates HVAC. (08 Marks)
 - b. Explain the principle of operation of a resonant transformer. (06 Marks)
 - c. A Cockcroft Walton type voltage multiplier has eight stages with capacitance, all equal to $0.05 \mu\text{F}$. The supply transformer secondary voltage is 125KV at a frequency of 150Hz. If the load current to be supplied is 5mA, Find :
 - i) percentage ripple
 - ii) the regulation. (06 Marks)

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

OR

- 4 a. With a circuit diagram, explain the tripping of an impulse generation with three electrode gap arrangement. (08 Marks)
- b. With a neat sketch, explain the Marx circuit arrangement for multistage impulse generator. (06 Marks)
- c. What is Tesla Coil? How are damped high frequency oscillations can be obtained using the Tesla Coil? (06 Marks)

Module-3

- 5 a. With a schematic diagram, explain the principle of operation of a generating voltmeter. What are its advantages and limitations? (10 Marks)
- b. Explain the principle of operation of an electrostatic voltmeter for measurement of very high dc and ac voltages. (10 Marks)

OR

- 6 a. Explain how Chubb and Frotscue circuit can be used to measure the peak value of ac voltages. (08 Marks)
- b. What are the various factors influencing the spark over voltage of sphere gaps and explain any two factors. (06 Marks)
- c. A generating voltmeter has to be designed so that it can have a range from 20 to 200KV dc. If the indicating meter reads a minimum current of $2\mu\text{A}$ and maximum current of $25\mu\text{A}$, what should the capacitance of the generating voltmeter be? Assume the speed of the driving synchronous motor is 1500 RPM. (06 Marks)

Module-4

- 7 a. Explain different theories of charge formation in cloud. (10 Marks)
- b. What is direct and indirect lightning stroke? Give reasons for induced voltage on the power line due to indirect stroke. (10 Marks)

OR

- 8 a. List the parameters to be considered for the selection of surge arrester voltage rating for EHV and UHV and also the types of surge arresters used. Explain function of surge arrester as a shunt protective device with a neat sketch. (10 Marks)
- b. A transmission line has the following line constants $R = 0.1\Omega/\text{km}$, $L = 1.26\text{mH}/\text{km}$, $c = 0.009\mu\text{F}/\text{km}$ and $G = 0$. If the line is a 3ϕ line and is charged from one end at a line voltage of 230KV, find the rise in voltage at the other end, if the line length is 400km. (10 Marks)

Module-5

- 9 a. With a necessary circuit diagram and pattern, explain discharge detection using straight detector for partial discharge measurement. (10 Marks)
- b. Explain the method of measuring capacitance and tan delta using shearing bridge. (10 Marks)

OR

- 10 a. What are the various tests done on transformers? Explain in detail impulse testing of transformer. (10 Marks)
- b. Explain in detail the testing of: i) Circuit breaker ii) Insulators. (10 Marks)

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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.

-
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

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 uplift 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) Attestation 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

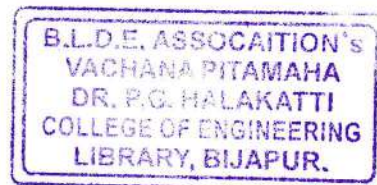
40. When the minerals are located to deep in the ground, the method used for mining is
a) Open pit method b) Quarries c) Surface mining d) Sub surface mining
41. Major pollution causing agent is
a) Man b) Animals
c) Hydrocarbon gases d) None of these
42. The result of ozone hole is
a) Acid rain b) UV 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 b) Lead
c) Tin 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 b) Respiratory problems
c) Soil erosion 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 b) Industrial pollutants
c) Acid rain 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) SO₂ c) CO d) O₃
66. Acid rain can be controlled by
 a) Reducing SO₂ and NO₂ 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) CO₂ d) Methane
69. Ozone layer thickness is measured in
 a) PPM b) PPB c) Decibels 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 b) Antartical
c) Tropical Region 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

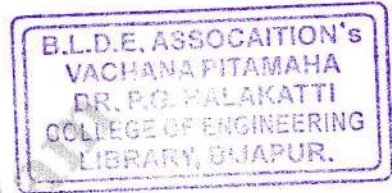
86. GIS stands for
a) Geographic Information System
b) Generic Information System
c) Geological Information System
d) Geographic Information Sharing
87. GIS deals with what kind and data
a) Numeric data b) Binary data c) Spatial data d) Complex data
88. Among the following _____ is example of hardware
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 Kejriwal
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



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18EE61

Sixth Semester B.E. Degree Examination, June/July 2023 Control Systems

Time: 3 hrs.

Max. Marks: 100

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

Module-1

- What is Control System? Compare open loop with closed loop control system. (05 Marks)
 - Explain Rotational motion of mechanical system. (05 Marks)
 - For the Mechanical System shown in Fig.Q1(c). Obtain f-v analogous electrical system.

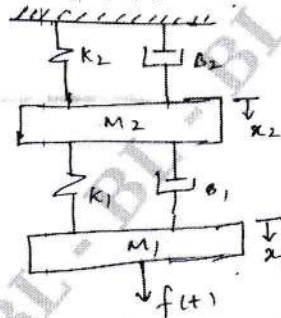


Fig.Q1(c)

(10 Marks)

OR

- Define open loop, closed loop and feedback control system. Mention one example on each type. (05 Marks)
 - Explain A.C. servomotor. (07 Marks)
 - Determine transfer function of mechanical system shown in Fig.Q2(c). Take θ_2 as output.

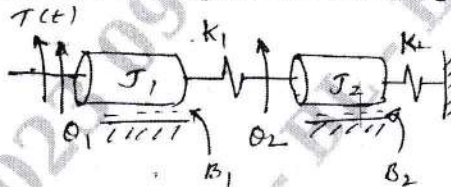
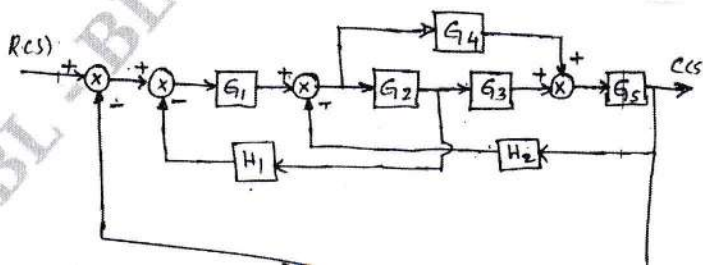


Fig.Q2(c)

(08 Marks)

Module-2

- What is block diagram? List the properties of block diagram. (05 Marks)
 - Derive an expression for open loop transfer function (OLTF) and closed loop transfer function (CLTF). (05 Marks)
 - For the block diagram shown in Fig.Q3(c). Determine the transfer function $C(s)/R(s)$ using block diagram algebra.



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

OR

- 4 a. Define :
- Source and sink node
 - Loop and loop gain
 - Forward path.
- b. Explain Mason's gain formula. (05 Marks)
- c. For the signal flow graph shown in Fig.Q4(c), obtain overall transfer function using Mason's gain formula. (05 Marks)

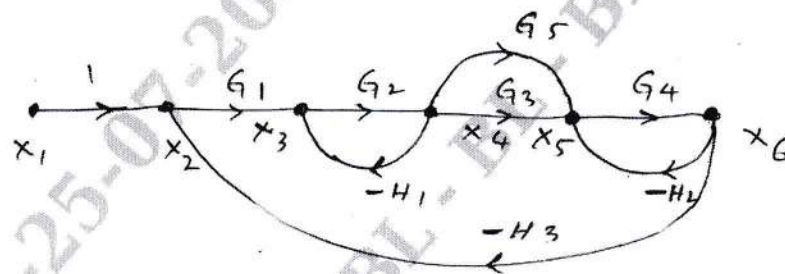


Fig.Q4(c)

(10 Marks)

Module-3

- 5 a. Derive an expression of second order system response for step input (under damped system). (06 Marks)
- b. An UFBCS has $G(s) = \frac{20(s+1)}{s^2(s^2+6s+8)}$. Find :
- Static error coefficient
 - Steady state error for step, ramp and parabolic input. (06 Marks)
- c. A second order system is given by $\frac{C(s)}{R(s)} = \frac{25}{s^2+6s+25}$. Find transient specification for unit step and assume 2% tolerance. (08 Marks)

OR

- 6 a. Explain difficulties and remedy of R - H criterion. (06 Marks)
- b. Check the stability of the given characteristic equation using R - H criteria : $s^4 + 2s^3 + 4s^2 + 6s + 8 = 0$. (06 Marks)
- c. A UFBCS has $G(s) = \frac{k(s+13)}{s(s+3)(s+7)}$. Using R - H criteria, calculate the range of 'K' for which the system is stable. (08 Marks)

Module-4

- 7 a. Explain :
- Angle of asymptotes
 - Break away points. (04 Marks)
- b. Sketch the root locus of UFBCS having $G(s) = \frac{k(s+1)}{s(s+2)(s^2+2s+2)}$. Mark the salient points. (16 Marks)

OR

- 8 a. Define :
i) Gain margin (GM) (04 Marks)
ii) Phase Margin (PM).
b. Construct the bode plot of a UFBCS with $G(s) = \frac{10(s+10)}{s(s+2)(s+5)}$. Find gain Margin and phase margin. Comment of stability. (16 Marks)

Module-5

- 9 a. Explain the Nyquist stability criteria. (08 Marks)
b. Sketch the Nyquist plot for the system with $G(s)H(s) = \frac{4s+1}{s^2(s+1)(2s+1)}$. (12 Marks)

OR

- 10 a. What is lead compensation? Explain the procedure to design lead-lag compensation in frequency domain. (08 Marks)
b. Explain : (12 Marks)
i) PI controller
ii) PD controller.

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Sixth Semester B.E. Degree Examination, June/July 2023 Power System Analysis – 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 is single line diagram? What is the need of single line diagram? Explain the procedure for finding the per unit reactance diagram by stating all the assumptions involved. (10 Marks)
- b. The single line diagram of a power system is shown in Fig.Q.1(b). Draw the per unit independence diagram.

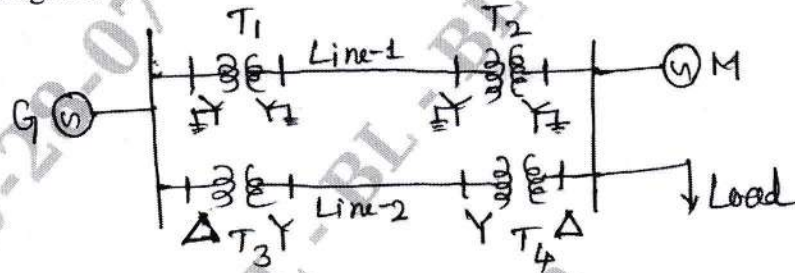


Fig.Q.1(b)

- G : 90MVA, 11KV, $X'' = 18\%$ Line 1 : $Z = j80\Omega$
 T₁ : 70MVA, 11/110KV, $X = 15\%$ Line 2 : $Z = j120\Omega$
 T₂ : 60MVA, 110/11KV, $X = 10\%$ M : 85MVA, 11KV, $X'' = 13\%$
 T₃ : Three 1 ϕ units, each rated at 10MVA, 11/127KV, $X = 9\%$
 T₄ : Three 1 ϕ units, each rated at 16.67MVA, 127/11KV, $X = 12\%$.
 The load absorbs 74MVA, 0.8pf lagging at 6.5KV. Select a common base of 100MVA, 11KV, on the generator side. (10 Marks)

OR

- 2 a. What is per unit system? List the advantages of a per unit system. (05 Marks)
- b. Show that the per unit impedance of a two winding transformer on either of its side is equal. (05 Marks)
- c. A single line diagram of a power system is shown in Fig.Q.2(c). Draw its impedance diagram, choose a base of 100MVA, 220KV in 50 Ω line. The ratings of generator, motor and transformer are given below.

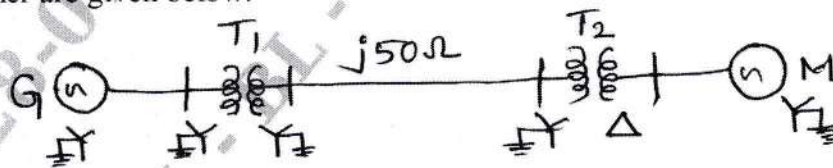


Fig.Q.2(c)

- G : 40MVA, 25KV, $X'' = 20\%$; M : 50MVA, 11KV, $X'' = 30\%$
 T₁ : 40MVA, 33/220KV, $X = 15\%$
 T₂ : 30MVA, 220/11KV, $X = 15\%$.

(10 Marks)

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

Module-2

- 3 a. With the oscillogram of the short circuit current of a synchronous machine, define direct axis synchronous reactance, transient and subtransient reactance. (10 Marks)
- b. A 100MVA, 13.8KV, 50HZ, Y-connected, 3 ϕ synchronous generator is connected to a 13.8/220KV, 100MVA, Δ -Y transformer. The machine reactance on its own base are $X_d = 1.1$ pu, $X'_d = 0.25$ pu ; The transformer reactance is 0.2pu. A 3 ϕ load of 100MVA, 0.8pf lag is connected to transformer secondary. A 3 ϕ short circuit occurs at the load terminals. Find the generator transient current, if before the fault, the load is operating at 220kV, choose a base of 220KV, 100MVA on HT side of the transformer. (10 Marks)

OR

- 4 a. Explain the doubling effect on transmission line under 3 ϕ short circuit with neat sketches. (08 Marks)
- b. For the radial network shown in Fig.Q.4(b), when a 3 ϕ fault occurs at point 'F'. Determine the fault current. Choose the generator ratings as a base values.
 G_1 : 10MVA, 11KV, $X'' = 20\%$
 G_2 : 10MVA, 11KV, $X = 12.5\%$
 T_1 : 10MVA, 11/33KV, $X = 10\%$
 T_2 : 25MVA, 33/6.6KV, $X = 8.7\%$
 Overhead line impedance, $Z = 6 + j10\Omega$
 Feeder impedance, $Z = 0.5 + j0.15\Omega$.

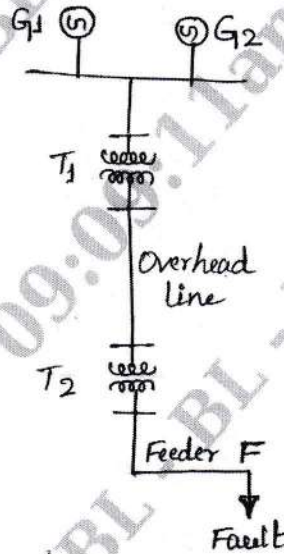


Fig.Q.4(b)

(12 Marks)

Module-3

- 5 a. What is symmetrical components? How they are useful in the solution of power system. (05 Marks)
- b. Show that the symmetrical component transformation is power invariant. (05 Marks)



- c. The original set of voltages are $V_a = 4 \angle 0^\circ$ volts, $V_b = 3 \angle -90^\circ$ volt and $V_c = 8 \angle 143.1^\circ$ is shown in Fig.Q.5(c). Find all the voltage components for the positive, negative and zero sequence systems. (10 Marks)

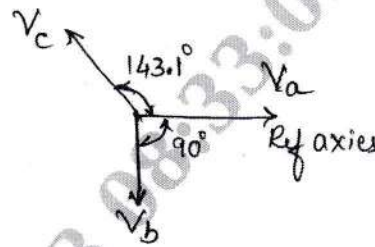


Fig.Q.5(c)

OR

- 6 a. Show that set of balanced phasors have only positive sequence symmetrical component. (05 Marks)
- b. Draw the zero sequence networks for the following 3 ϕ transformers:
i) $Y_{\text{L}} - Y_{\text{L}}$ ii) $Y_{\text{L}} - Y$ iii) $\Delta - \Delta$ iv) $Y_{\text{L}} - \Delta$ v) $Y - \Delta$ (05 Marks)
- c. A 3 ϕ , star connected load shown in Fig.Q.6(c), is connected to a 3 ϕ supply having a line voltage of 440 volts. Calculate the current in the line in terms of symmetrical components.

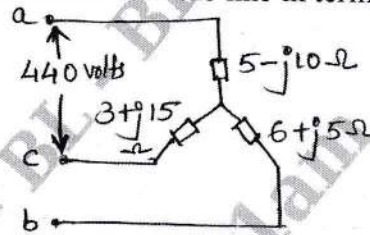


Fig.Q.6(c)

(10 Marks)

Module-4

- 7 a. Derive an expression for fault current, when double line to ground fault through impedance occurs on power system. (10 Marks)
- b. For the power system shown in Fig.Q.7(b), double line to ground fault occurs at the middle of the transmission line at point 'P'. Find the total fault current using symmetrical components on a base 50MVA, 220KV in the generator circuit.

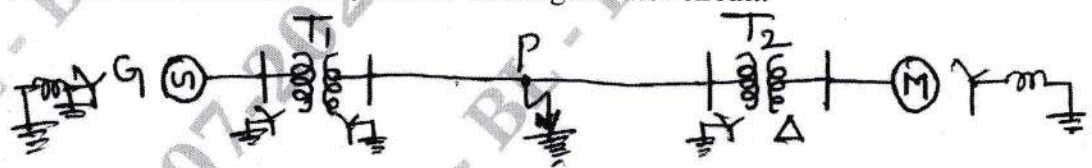


Fig.Q.7(b)

The ratings are

G : 40MVA, 25KV, $X'' = X_2 = 20\%$, $X_0 = 10\%$, $X_n = 2\%$

M : 50MVA, 11KV, $X'' = X_2 = 30\%$, $X_0 = 15\%$, $X_n = 2\%$

T₁ : 40MVA, 33/220KV, $X = 15\%$

T₂ : 30MVA, 11/220KV, $X = 15\%$

Transmission line : $X_1 = X_2 = 50\Omega$, $X_0 = 150\Omega$.

(10 Marks)

OR

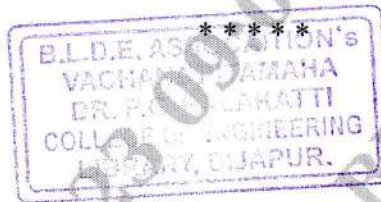
- 8 a. Derive an expression for fault current for SLG fault, without fault impedance on an alternator. (10 Marks)
- b. A 25MVA, 13.2KV alternator, with a solidly grounded neutral has a subtransient reactance of 0.25pu. The negative and zero sequence reactance's are 0.35 and 0.1pu respectively. Determine the fault current when the line to line fault occurs at the terminals of the alternator. Neglect the resistance. (10 Marks)

Module-5

- 9 a. Derive an expression for the swing equation. (10 Marks)
- b. A 50HZ, 4 pole turbo generator rated 150MVA, 11KV has an inertia constant of 9MJ/MVA, find:
- Stored energy at synchronous speed.
 - The rotor acceleration, if the input mechanical power is raised to 100MW, when the electrical load is 75MW.
 - The speed at the end of 10 cycles, if the acceleration is assumed constant at the initial value. (10 Marks)

OR

- 10 a. What is critical clearing time? Derive an expression for initial clearing angle, given that $P_1 = P_{\max} \sin \delta$, $P_2 = \gamma_2 P_{\max} \sin \delta$, $P_3 = \gamma_3 P_{\max} \sin \delta$ as the power angle equations respectively for prefault, during fault and post fault conditions respectively. (10 Marks)
- b. A transfer reactance between a generator and an infinite bus bar operating at 220KV under various conditions on the inter connector are: Pre fault : 150Ω/ph, during fault : 400Ω/ph, post fault : 200Ω/ph. If the fault is cleared when the rotor has advanced by 60° electrical from its prefault position, determine the maximum load that could be transferred without loss of stability. Take a base power of 266.67MW. (10 Marks)



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Sixth Semester B.E. Degree Examination, June/July 2023

Digital Signal Processing

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 DFT of the sequence $x(n) = \{1, 1, 1, 1\}$ for $N = 8$. Plot magnitude and phase spectrum of $x(k)$. (10 Marks)
- b. State and prove the following properties of DFT
 i) Linearity ii) Periodicity property iii) Parseval's theorem. (10 Marks)

OR

- 2 a. The first values of an 8-point DFT of real value sequence is $\{4, 1-j2.414, 0, 1-j0.414, 0\}$. Find the remaining values of the DFT. (04 Marks)
- b. Obtain the circular convolution of $x(n) = \{1, 2, 3, 4\}$ with $h(n) = \{1, 1, 2, 2\}$. (06 Marks)
- c. A long sequence $x[n]$ is filtered through a filter with impulse response $h[n]$ to yield $y[n]$. If $x(n) = \{1, 4, 3, 0, 7, 4, -7, -7, -1, 3, 4, 3\}$ $h[n] = \{1, 2\}$. Compute $y[n]$ using overlap-add technique. Use only 5 point circular convolution. (10 Marks)

Module-2

- 3 a. Tabulate the comparison of complex addition and multiplications for direct computation of DFT verses the FFT algorithm for $N = 16, 32$ and 128 . (10 Marks)
- b. Develop an 8-point DIT.FFT algorithm. Draw the complete signal flow graph. (10 Marks)

OR

- 4 a. Given the sequences $x_1[n]$ and $x_2[n]$ below. Compute the circular convolution $x_1[n] \otimes_N x_2[n]$ for $N = 4$. Use DIT-FFT algorithm.
 $x_1[n] = \{2, 1, 1, 2\}$ $x_2[n] = \{1, -1, -1, 1\}$ (10 Marks)
- b. First 5 samples of the 8-point DFT of a real valued sequence is given by $x(0) = 0, x(1) = 2 + j2, x(2) = -j4, x(3) = 2 - j2, x(4) = 0$. Determine the remaining points, hence find the original sequence $x[n]$ using DIF - FFT algorithm. (10 Marks)

Module-3

- 5 a. Transform $H(s) = \frac{s+1}{s^2+5s+6}$ into digital filter using impulse invariant transformation with $T = 0.1$ sec. (08 Marks)
- b. Explain bilinear transformation method of converting analog filter into digital filter; Show the mapping from S- plane to Z-plane. Also obtain the relation between ω and Ω . (12 Marks)

OR

- 6 a. Design a unit bandwidth 3dB digital Butterworth filter and order ONE by using bilinear transformation. (08 Marks)
- b. A digital low pass filter is required to meet the following specifications
 $20 \log |H(\omega)|_{\omega=0.2\pi} \geq -1.9328\text{dB}$
 $20 \log |H(\omega)|_{\omega=0.6\pi} \leq -13.9794\text{dB}$
 The filter must have a maximally flat frequency response. Find $H(z)$ to meet the above specifications using impulse invariant transformation. Assume $T = 1\text{sec}$. (12 Marks)

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



Module-4

- 7 a. Bring out a comparison between Butterworth filter and Chebyshev filter. (06 Marks)
- b. Design a digital filter using Bilinear transformation to is for the following specifications :
 - i) Monotonic pass and stop bands ii) - 3.01dB cutoff frequency of 0.5π iii) Magnitude down at least 15dB at 0.75π . Assume $T = 1$ Sec. (14 Marks)

OR

- 8 a. Realize the transfer function of the system defined by the differential equation using direct form I and direct form II

$$y[n] - \frac{3}{4}y[n-1] + \frac{1}{8}y[n-2] = x[n] + \frac{1}{3}x[n-1]$$
 (10 Marks)
- b. Obtain the parallel form for the given transfer function

$$H(z) = \frac{8z^3 - 4z^2 + 4z - 2}{\left(z - \frac{1}{4}\right)\left(z^2 - z + \frac{1}{2}\right)}$$
 (10 Marks)

Module-5

- 9 a. A lowpass filter is to be designed with the following desired frequency response

$$H_d(e^{jw}) = H_d(w) = \begin{cases} e^{-j2w} & |w| < \frac{\pi}{4} \\ 0 & \frac{\pi}{4} < |w| < \pi \end{cases}$$

Determine the filter coefficients $h_d(n)$ and $h(n)$ if $w(n)$ is a rectangular window defined as follow

$$W_R(n) = \begin{cases} 1 & 0 \leq n \leq 4 \\ 0 & \text{otherwise} \end{cases}$$

- b. Also find the frequency response, $H(w)$ of the resulting FIR filter. (10 Marks)
The desired response of a low pass filter is

$$H_d(e^{jw}) = e^{-j2w} \quad -\frac{\pi}{4} \leq w \leq \frac{\pi}{4}$$

$$= 0 \quad \frac{\pi}{4} < |w| \leq \pi$$

Determine $H(e^{jw})$ /FIR using the Hamming window. (10 Marks)

OR

- 10 a. Determine the filter coefficient $h(n)$ obtained by sampling

$$H_d(e^{jw}) = \begin{cases} e^{-j(M-1)w/2} & 0 \leq |w| \leq \frac{\pi}{2} \\ 0 & \frac{\pi}{2} \leq |w| \leq \pi \end{cases}$$

For $M = 7$. (10 Marks)

- b. Given $H(z) = (1 + z^{-1})\left(\frac{1}{2} - \frac{1}{4}z^{-1} + \frac{1}{2}z^{-2}\right)$ for an FIR system obtain the realization in

- i) Direct Form ii) Cascade form iii) Linear phase. (10 Marks)

CBCS SCHEME

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18EE653

Sixth Semester B.E. Degree Examination, June/July 2023 Renewable Energy Resources

Time: 3 hrs.

Max. Marks: 100

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

Module-1

- 1 a. Discuss causes of energy scarcity. Mention factors to be considered for solving energy crunch problems. (10 Marks)
b. Explain the classification of energy resources. (10 Marks)

OR

- 2 a. With a neat sketch explain layers of sun. (10 Marks)
b. Define the following terms with help of diagram.
i) Hour angle ii) Declination angle. (10 Marks)

Module-2

- 3 a. Explain with a neat sketch Heliostat electric generating plant. (10 Marks)
b. With the help of neat diagram, explain any of the dryer. (10 Marks)

OR

- 4 a. With a neat sketch explain key elements of photo - voltaic cell. (10 Marks)
b. Find the number of solar cells for the array area of 28.5m^2 if each cell has a diameter of 2.25 inches. (04 Marks)
c. Discuss photovoltaic panels with appropriate equations. (06 Marks)

Module-3

- 5 a. Discuss the applications, advantages and disadvantages hydrogen energy. (10 Marks)
b. Explain the thermochemical hydrogen production technology. (10 Marks)

OR

- 6 a. Describe the main considerations in selecting site for wind generations. (06 Marks)
b. With a neat sketch explain dry steam geothermal electric power plant. (10 Marks)
c. Discuss advantages of waste recycling system. (04 Marks)

Module-4

- 7 a. Draw the sketch of updraft - draft gasifier and discuss its working and applications. (06 Marks)
b. Explain construction parts of Biogas plant with the help of neat sketch. (10 Marks)
c. Discuss factors affecting the selection of a bio gas plant. (04 Marks)

OR

- 8 a. Discuss tidal power generation in India. (04 Marks)
b. Explain the single basin and two basin systems of tidal power harnessing. (10 Marks)
c. Explain applications of bio - mass Gasifiers. (06 Marks)

Module-5

- 9 a. With neat sketch explain two types of ocean thermal energy conversion plants. (10 Marks)
b. Explain oscillating water column devices to harness sea wave energy. (10 Marks)

OR

- 10 a. Write a short note on ocean thermal energy for closed cycle. (10 Marks)
b. Explain the devices used for harnessing wave energy. (10 Marks)

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

CBCS SCHEME



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18EE646

Sixth Semester B.E. Degree Examination, June/July 2023 Electric Vehicle Technologies

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 configuration of modern electric vehicle drive train with a neat functional diagram. (08 Marks)
- b. Define a series hybrid electric vehicle and explain its configuration with a neat diagram incorporating various modes of operation. (12 Marks)

OR

- 2 a. Draw and explain various possible EV configurations based variations in electric propulsion characteristics and energy sources. (10 Marks)
- b. Define a parallel hybrid electric vehicle and explain its configuration with a neat diagram. (10 Marks)

Module-2

- 3 a. List out and explain in detail, various requirements of energy storage devices used in automotive applications. (08 Marks)
- b. Classify various fuel-cell technologies based on electrolyte used. Also explain the following fuel cell technologies in detail with relevant chemical reactions:
(i) PEMFC (ii) MCFC (iii) SOFC (12 Marks)

OR

- 4 a. Define and explain the following battery parameters:
(i) Battery coulometric capacity
(ii) State-of-charge (SOC)
(iii) Discharge rate
(iv) Battery energy (08 Marks)
- b. Develop a Fractional Depletion Model (FDM) of batteries using constant current discharge approach. (06 Marks)
- c. Explain the basic principle of operation of a double layer ultra capacitor with a neat diagram. (06 Marks)

Module-3

- 5 a. Explain the operation of following DC drives with a neat circuit diagram and steady-state waveforms:
(i) Step-down chopper drive
(ii) Step-up chopper drive
(iii) Class - C chopper drive (12 Marks)
- b. Explain the following control schemes of a BLDC motor drive with a relevant block diagram:
(i) Torque control scheme
(ii) Speed control scheme (08 Marks)

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

OR

- 6 a. Explain the constant v/f control of inductor motor for varying its torque-speed characteristics with relevant curves. Also depict the power electronic control for v/f control with the help of block diagram. (12 Marks)
- b. Explain the operation of classic half bridge converter used in SRM drives with the help of a circuit diagram. (08 Marks)

Module-4

- 7 a. Explain various configurations of electrical coupling device in the design of series hybrid electric drive trains. Also explain the operation of different bidirectional DC/DC converters used in it. (12 Marks)
- b. Explain the engine power design of a torque coupled hybrid electric drive train with relevant equations and curves. (08 Marks)

OR

- 8 a. Explain the following control strategies employed in a parallel hybrid electric drive train:
 (i) Max. SOC-of-PPS control strategy with a neat flow chart and speed-traction characteristics.
 (ii) Engine on-off control strategy (12 Marks)
- b. Explain the power rating design of traction motor in a series hybrid electric drive with relevant equations and curves. (08 Marks)

Module-5

- 9 a. List out and explain in detail various charging methods of battery used in EV and HEV. (12 Marks)
- b. Explain the following transformer less charger topology for battery with a neat circuit diagram:
 (i) Simple buck technology
 (ii) Neutral-point clamped topology (08 Marks)

OR

- 10 a. Explain the high frequency transformer based two-stage isolated charger topology for batteries used in EV and HEV with a neat circuit diagram. Also explain in detail about the design of various components of it. (12 Marks)
- b. Explain in detail about the design of z-circuit capacitor and inductor with relevant equations. (08 Marks)

