

Roll No: 24Z360

(To be filled in by the candidate)

PSG COLLEGE OF TECHNOLOGY, COIMBATORE - 641 004

SEMESTER EXAMINATIONS, JANUARY 2025

BE – COMPUTER SCIENCE AND ENGINEERING(AI & ML) / CSE Semester: 1

23N102 / 23Z102 BASICS OF ELECTRICAL AND ELECTRONIC SYSTEMS

Time : 3 Hours

Maximum Marks : 100

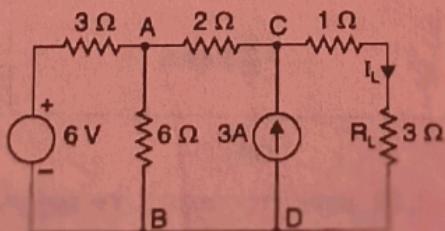
INSTRUCTIONS:

1. Answer ALL questions. Each question carries 20 Marks.
2. Subdivisions (a)(i) and (a)(ii) carries 2 marks each, subdivision (b) carries 6 marks each and subdivision (c) carries 10 marks each.
3. Course Outcome :

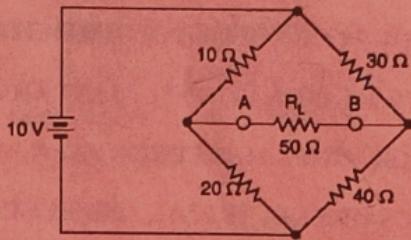
Qn.1	CO1	Qn.2	CO2	Qn.3	CO3	Qn.4	CO4	Qn.5	CO5
Table									

COs	At the end of learning this course, students will be able to
CO1	Apply the knowledge of network theorems to solve complex DC circuits
CO2	Apply the AC theorems to solve complex AC circuits
CO3	Apply the fundamentals of magnetism to solve magnetic circuits
CO4	Apply the knowledge of semiconductors to illustrate the functioning of basic electronic devices
CO5	Familiarize the concepts of operational amplifier and apply it for mathematical operations

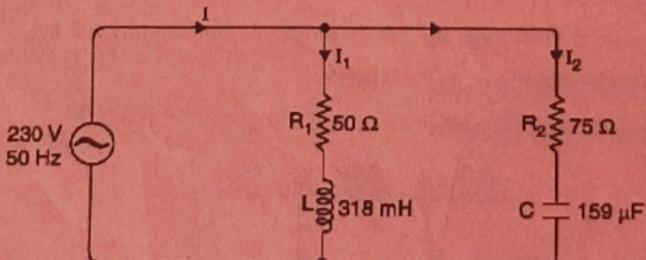
- | | Question | (BTL) |
|--|----------|-------|
| 1. a) i) Write the steps involved in solving the electrical network circuits by
Thevenin's theorem | (L2) | |
| ii) A copper wire is stretched so that its length is increased by 0.1%. What is
the percentage change in its resistance ? | (L3) | |
| b) Using source conversion technique, find the current through R_L . | (L3) | |



- c) Find the Norton current passing through R_L in the unbalanced bridge. (L3)

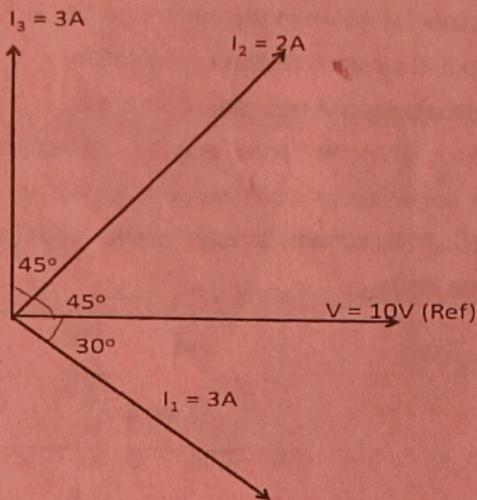


2. a) i) A coil takes a current of 6 A when connected to a 24V d.c. supply. To obtain the same current with a 50 Hz a.c. supply, the voltage required was 30 V. Calculate the reactance of the coil. (L3)
- ii) An R-L-C series circuit consists of a resistance of $1000\ \Omega$, an inductance of 100mH and a capacitance of 10^{-11}F . If a voltage of 100 V is applied across the combination, find the resonance frequency of the circuit. (L3)
- b) A 400 V, 3-φ supply is connected to a balanced network of three impedances each consisting of a $20\text{-}\Omega$ resistance and a $15\text{-}\Omega$ inductive reactance. If the three impedances are (a) star-connected, and (b) delta-connected, in each case determine (i) the line current, (ii) the power factor, and (iii) the total power in kW. (L3)
- c) i) For the AC circuit shown below, calculate the total current and power factor of the circuit. (L3)

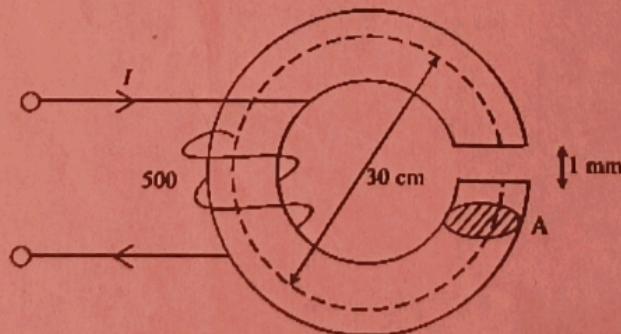


(OR)

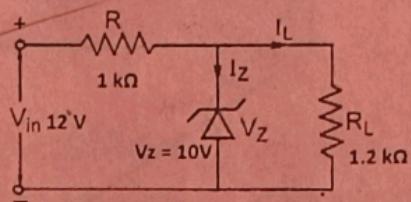
- ii) In a particular A.C. circuit, three impedances are connected in parallel, currents as shown in the below figure are flowing through its parallel branches ($I_1 & I_3 = 3\text{A}$, $I_2 = 2\text{A}$). Write the equations for the currents in terms of sinusoidal variations and draw the waveforms. Find the total current supplied by the source.



3. a) i) An airplane travels 1000 km/h in a region where the Earth's magnetic field is about 5×10^{-5} T and is nearly vertical. What is the potential difference induced between the wing tips that are 70 m apart? (L3)
- ii) When two coils having inductances of 5H and 4H, respectively were wound uniformly onto a non-magnetic core, it was found that their mutual inductance was 1.5H. Calculate the coupling coefficient that exists between them. (L3)
- b) Discuss the different types of losses occur in transformer material. (L2)
Suggest any two methods to minimize it.
- c) A ring of 30 cm mean diameter is made using a cylindrical iron rod of diameter 2.5 cm. A saw-cut 1-mm wide is made through the ring to create an air gap. A coil with 500 turns of wire is wound on the ring. Calculate the current required in the exciting coil to produce a flux of 4 mWb in the ring. Assume the relative permeability of iron at this flux density as 800. Neglect any leakage or fringing of the magnetic field. (L3)



4. a) i) Establish the relationship between the current gain of a BJT in common base configuration and common emitter configuration (L2)
- ii) Write any two materials used to fabricate photo diode (L2)
- b) Explain the working of zener diode and its characteristics with neat diagram. For the below zener diode network, determine the (i) voltage across R and R_L , (ii) current through zener diode and (iii) power dissipated by zener diode (L3)



- c) i) Discuss the input and output characteristics of BJT in common emitter configuration. How BJT is used as an amplifier with the neat circuit diagram. Sketch the input and output wave form. (L2)

(OR)

- ii) Explain the operation of Full-wave rectifier circuit with relevant diagram and derive the expressions for rectifier efficiency.

5. a) i) For an Op Amp having a slew rate of $SR = 2 \text{ V/s}$, what is the maximum closed loop voltage gain that can be used when the input signal varies by 0.5 V in 10s ? (L3)
- ii) How does positive feedback affect the stability of Op Amp circuit? (L2)
- b) List the six characteristics of an ideal op-amp and explain in detail. Give the practical op-amp equivalent circuit. (L2)
- c) With a neat circuit diagram explain the operation of an Op-Amp as an adder and subtractor. Derive an expression for their output voltages. (L2)

CO : COURSE OUTCOME; BTL : BLOOM'S TAXONOMY LEVEL

/END/

FD/VS