

Enrollment No./Seat No.:

GUJARAT TECHNOLOGICAL UNIVERSITY
Bachelor of Engineering - SEMESTER - III EXAMINATION - WINTER 2025

Subject Code: BE03024011

Date: 15-12-2025

Subject Name: Network Theory

Time: 10:30 AM TO 01:00 PM

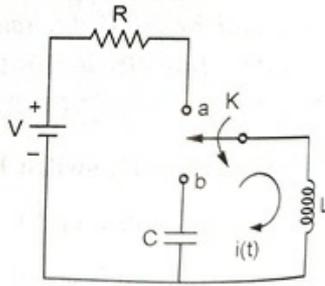
Total Marks: 70

Instructions

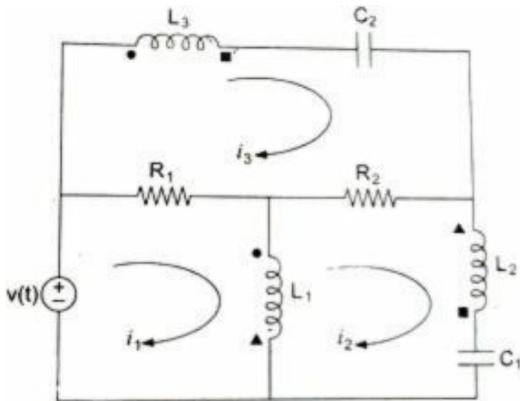
- 1. Attempt all questions.**
- 2. Make suitable assumptions wherever necessary.**
- 3. Figures to the right indicate full marks.**
- 4. Simple and non-programmable scientific calculators are allowed.**

| | Marks |
|--|--------------|
| Q.1 (a) State Kirchhoff's Voltage Law (KVL) and Kirchhoff's Current Law (KCL). | 03 |
| (b) Recall the formula to convert a star (Y) connected network to a delta (Δ) connected network. | 04 |
| (c) Define the following terms associated with electric circuits: Node, Branch, Mesh, Loop with a suitable example & Fig. | 07 |
| Q.2 (a) State the Superposition Theorem. | 03 |
| (b) State and Explain Thevenin Theorem. | 04 |
| (c) State the Maximum Power Transfer Theorem for a DC circuit. Recall the condition for maximum power transfer and list the expression for the maximum power delivered to the load. | 07 |
| OR | |
| (c) Explain the importance of Dot convention in coupled circuits with a suitable example. | 07 |
| Q.3 (a) Define the Time Constant ? what is its significance? | 03 |
| (b) Identify and state the properties of current in an inductor and voltage across a capacitor at $t=0+$ (after the switch closes). | 04 |
| (c) Derive voltage and current relationships in R, L and C. Also mention the initial and final conditions for R, L, and C components in different cases. | 07 |
| OR | |
| (a) Define Transient Response and Steady-State Response. | 03 |
| (b) Discuss the terms (1) RMS value (2) Average power (3) Complex power (4) Apparent power. | 04 |

- (c) In the network shown, the switch K is moved to position b at $t=0$. If $V=100$ V, $R=1000 \Omega$, $C=0.5 \mu\text{F}$, $L=1$ H, find di/dt and d^2i/dt^2 at $t=0^+$. 07



- Q.4** (a) Define the term Phasor and state its use in AC circuit analysis. 03
 (b) Obtain step response of series R-L circuit. 04
 (c) Formulate the loop equations for network shown in given figure 2. 07



OR

- (a) Define power factor. what is the power factor of a pure inductor? 03
 (b) Explain time constant in case of series R-L and series R-C circuit. 04
 (c) What are initial conditions in circuit elements? Explain the physical constraints that prevent the voltage across a capacitor and the current through an inductor from changing instantaneously. 07
- Q.5** (a) Explain concept of Laplace transformation. what are the advantages and disadvantages of Laplace transformation? 03
 (b) Define poles & Zeros of network function. Explain significance of poles and zeros in different network functions. 04
 (c) Evaluate the Initial Value Theorem and the Final Value Theorem of Laplace Transforms. 07

OR

- (a) List the four main types of Passive Filters based on their frequency response. 03
 (b) What is the condition of symmetry of all different two port parameters? 04
 (c) Evaluate the Z parameters in terms of h parameters. 07
