

Enrolment No./Seat No _____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER-III EXAMINATION – SUMMER 2025

Subject Code:3132406

Date:31-05-2025

Subject Name:Circuit Theory

Time:02:30 PM TO 05:00 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.

- Q.1** (a) State and explain Kirchhoff's law. **03**
(b) Compare Node voltage analysis & Loop variable analysis in tabular form. **04**
(c) (i) Simplify the Network shown in Fig.1 using Source transformation for both voltage sources and find out the value of current i_{10} . **07**
(ii) Explain Reciprocity theorem with help of circuit and network.
- Q.2** (a) Why study initial condition? Enlist the advantages which results from this understanding of initial condition. **03**
(b) Mention the initial and final condition for R, L & C components in the different cases. **04**
(c) Calculate the current passing through $10\ \Omega$ resistor in the Fig.2 using Mesh current method. **07**
- OR**
- (c) Obtain the value of Thevenin's equivalent voltage and Thevenin's equivalent resistance for the Network shown in Fig.3. **07**
(Assume Voltage source = 10V)
- Q.3** (a) Explain in brief Dot Convention in coupled circuits. **03**
(b) What are the Network Elements and how it respond when Electric energy supplied to it. What are the relationship between Voltage and Current in Resistor, Inductor & Capacitor. **04**
(c) In the network shown in Fig.4, Switch "K" is moved from position 'a' to 'b' at time $t=0$. Steady state having previously been attained. Determine value of Current $i(t)$. **07**
- OR**
- Q.3** (a) Discuss concept of Duality. **03**
(b) Explain in brief Power Triangle and Tuned circuit. **04**
(c) As shown in Fig.5 a Series RLC circuit having zero inductor current and zero capacitor voltage is excited by 20V dc source. Assume value of Resistor $R = 10\ \Omega$, $L = 2H$ and $C = 10\mu F$. Switch "K" is connected in series with RLC. Find out $i(0+)$ and $di/dt(0+)$ **07**
- Q.4** (a) Explain in brief Star-Delta Connection. **03**
(b) State Properties of Laplace Transform. **04**
(c) List the steps for analysis of network using Laplace Transformation Method. **07**
- OR**
- Q.4** (a) Discuss Frequency response for Series resonance. **03**

- (b) Write a technical note on:- Steady and Transient Response. 04
 (c) Discuss concept of Poles and Zeros in a network function. 07
 Q.5 (a) Discuss relationship of Two Port Variables. 03
 (b) Discuss frequency response for Parallel resonance. 04
 (c) Find out the Y-Parameter of the network shown in the Fig.6. 07

OR

- Q.5 (a) Derive Z- parameters in terms of Y-parameters. 03
 (b) Define followings:- (i) average power (ii) complex power (iii) Potential difference (iv) Super node 04
 (c) Find out the Z-Parameter of the Two port network shown in the Fig.7. 07


