

Roll No. _____

Total Page No. : 6

31N0501 /
31N0601

31N0501 / 31N0601

B. TECH. III Sem Main /Back

Exam : 2025-2026

**Electrical and Electronics Engineering
and Electrical Engineering**

(3EX4-01/3EE4-01) - Electrical Circuit Analysis - I

Time : 3 Hours]

[Max. Marks : 70

[Min. Passing Marks :

Instructions to Candidates :

Part-A : Short answer questions (up to 25 words) $10 * 2 = 20$ marks.

All ten questions are compulsory.

Part-B : Analytical/Problem Solving questions $5 * 4 = 20$ marks.

Candidates have to answer 5 questions out of 7.

Part-C : Descriptive/Analytical/Problem Solving questions $3 * 10 = 30$ marks.

Candidates have to answer 3 questions out of 5.

Schematic diagrams must be shown wherever necessary. Any data you feel missing may suitably be assumed and stated clearly.

Units of quantities used/calculated must be stated clearly.

Use of following supporting materials is permitted during examination.

(Mentioned in form No. 205)

1 NIL

2 NIL

Part-A

10x2=20

- Q.1 What is the major difference between the Mesh and Loop? [2]
- Q.2 Define Cut-set and Tie-set matrix. [2]
- Q.3 State and explain maximum power transfer theorem. [2]
- Q.4 Explain initial and final condition in network elements (L and C). [2]
- Q.5 What do you mean by steady state and transient state response? [2]
- Q.6 Write down the definition of Laplace Transform. Find the Laplace Transform of $t e^{-2t}$ [2]
- Q.7 Define the time constant for first order R-L and R-C circuits. [2]
- Q.8 State the time displacement theorem in the Laplace transform. [2]
- Q.9 Write a short note on a series RLC circuit resonance. [2]
- Q.10 Relate the active power, reactive power and apparent power. [2]

Part-B

5x4=20

- Q.1 State and explain Reciprocity theorem with suitable example. Also write the steps for solving a network using Reciprocity theorem. [4]

- Q.2 Apply superposition theorem to the given circuit (figure 1), to find the voltage drop V across the $5\ \Omega$ resistor. [4]

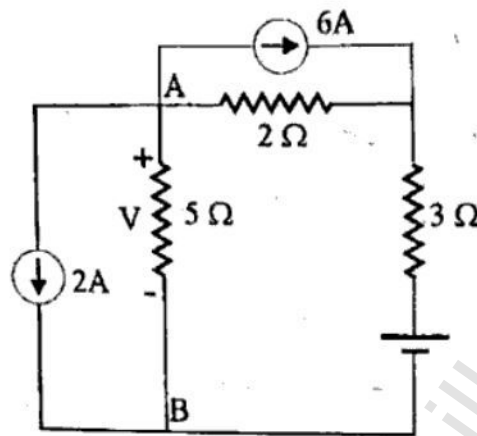
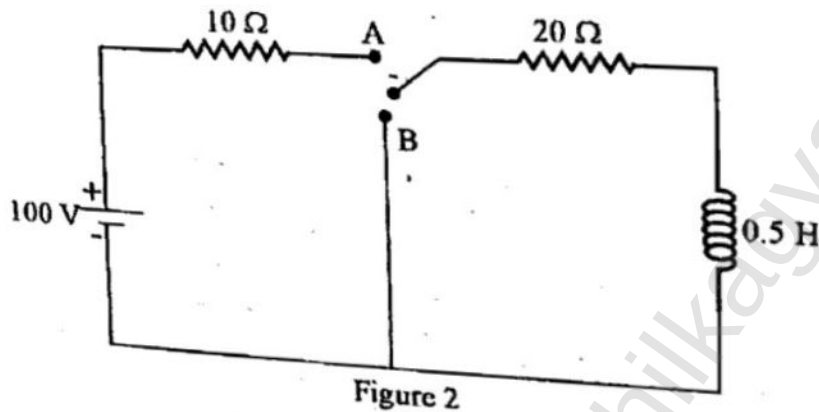


Figure 1

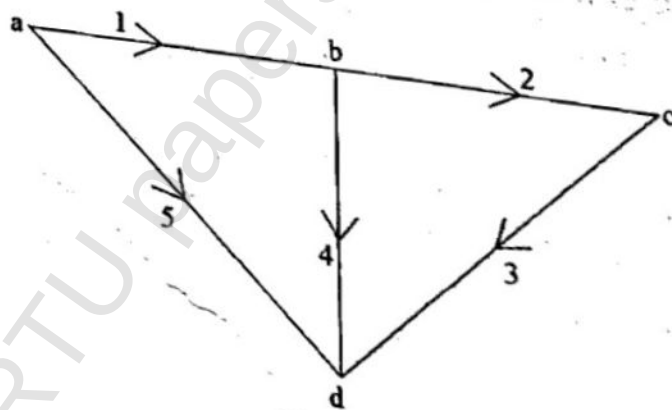
- Q.3 A coil of resistance $12\ \Omega$ and inductance $18\ \text{H}$ are suddenly connected to a DC supply of $30\ \text{V}$. Calculate: [4]
- The initial current,
 - The time constant,
 - Current after $5\ \text{sec.}$,
 - The energy lost as heat during this time.
- Q.4 A $10\ \text{HP}$ induction motor is supplied from a $400\ \text{V}$ 3-phase $50\ \text{Hz}$ power supply. The efficiency being 90% the power factor of operation is 0.8 . Find the following: [4]
- Active power consumed,
 - Reactive power,
 - Apparent Power,
 - Line current.

- Q.5 In figure 2, switch is closed at position A, at $t=0$ the switch is moved to position B. Find the currents in both the cases. [4]



- Q.6 A function in s-domain is given by $I(s) = \frac{250}{(s+2)(s^2+625)}$. Find $i(t)$. [4]

- Q.7 Obtain the incidence matrix of the following graph shown in figure 3.



PART C

3x10=30

- Q.1 Find the transient and steady state responses of series RL, RC and RLC circuit having sinusoidal excitation. [10]
- Q.2 Find the Laplace transform of the function $x(t) = \mu(t) - \mu(t-\theta)$. Also a function is given by $X(s) = \frac{2(s+2)}{(s+1)(s+3)}$. Find its initial and final value using the initial value theorem and the final value theorem. [10]
- Q.3 State the Thevenin's theorem. Obtain the current in 5Ω resistor connected between terminals x and y by Thevenin's theorem in the circuit shown in the Figure 4. [10]

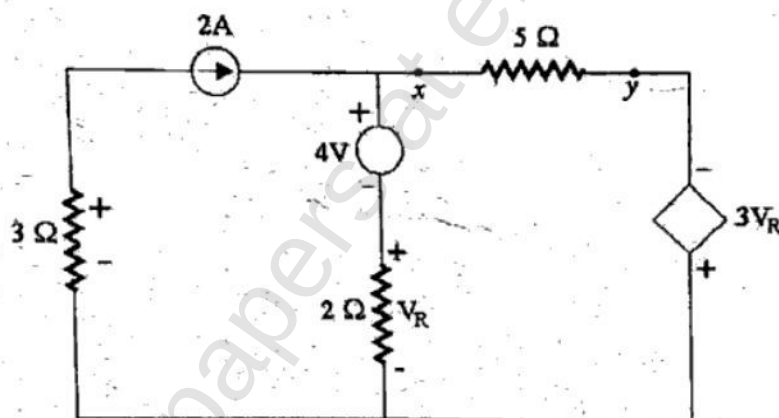


Figure 4

- Q.4 What is the relationship between line and phase voltages and currents in a connection? Also explain power factor, active power, apparent power and reactive with the help of power triangle. [10]

Q.5 Find the resonant frequency for the parallel circuit shown in figure 5.
[10]

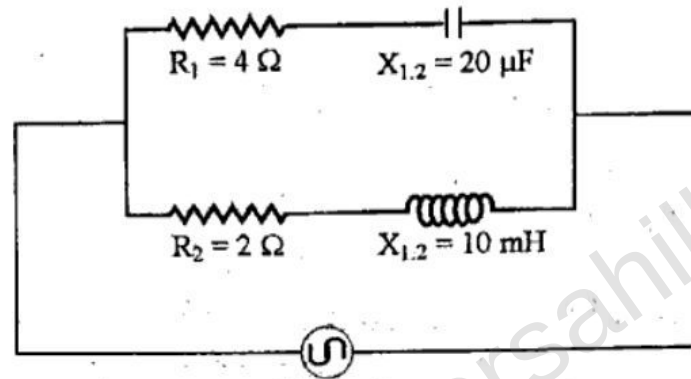


Figure 5
