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Question Paper Code: R3403

B.E. / B.Tech. DEGREE EXAMINATION, NOV 2025

Third Semester

Electronics and Communication Engineering

R21UEC303- CIRCUIT THEORY

(Regulations R2021)

Duration: Three hours

Maximum: 100 Marks

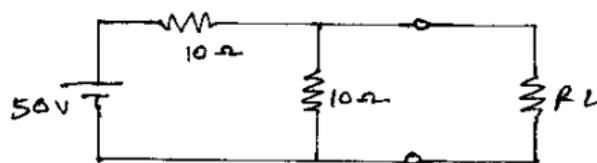
Answer ALL Questions

PART A - (5 x 1 = 5 Marks)

1. If a resistor has 5.5V across it and 3mA flowing through it, what is the power CO1- U
a) 16.5 mW b) 15 mW c) 1.83 mW d) 16.5 W
2. Compensation theorem is applicable to CO1- U
a) linear networks only b) non-linear networks only
c) linear and nonlinear networks d) neither of the two
3. What is the impedance of an ideal parallel resonant circuit without resistance in either branch? CO1- U
a) Zero b) inductive c) capacitive d) infinite
4. The time constant of a series RL circuit is CO1- U
a) LR b) L / R c) L²R d) L / R
5. A two-port network is simply a network inside a black box, and the network has only : CO1- U
a) two terminals b) two pairs of accessible terminals
c) two pairs of ports d) None of the mentioned

PART – B (5 x 3= 15 Marks)

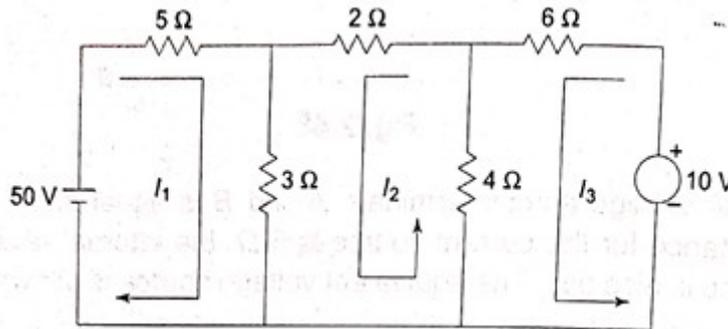
6. State Kirchoff's Laws CO1- U
7. Calculate the value of load resistance, so that maximum power is transferred from battery. CO3 -App



8. What is resonant frequency and bandwidth of series RLC circuit? Given that $R=10\ \Omega$, $L=0.5\ \text{mH}$, $C=10\ \mu\text{F}$. CO4 -App
9. An RC circuit has $R = 20\ \Omega$ and $C = 400\ \mu\text{F}$. What is its time constant?. CO1 -U
10. Give the condition for reciprocity for Z parameters. CO1-U

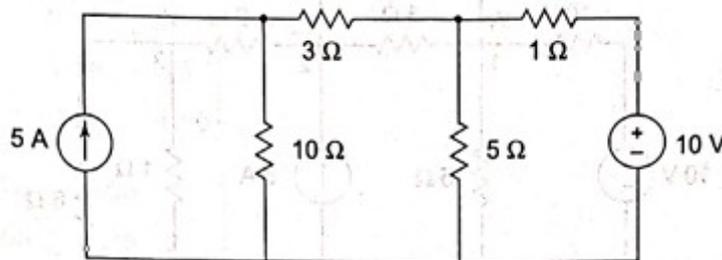
PART – C (5 x 16= 80 Marks)

11. (a) Determine the power dissipation in the 4 ohm resistor of the circuit shown in fig by using mesh analysis CO2 - App (16)

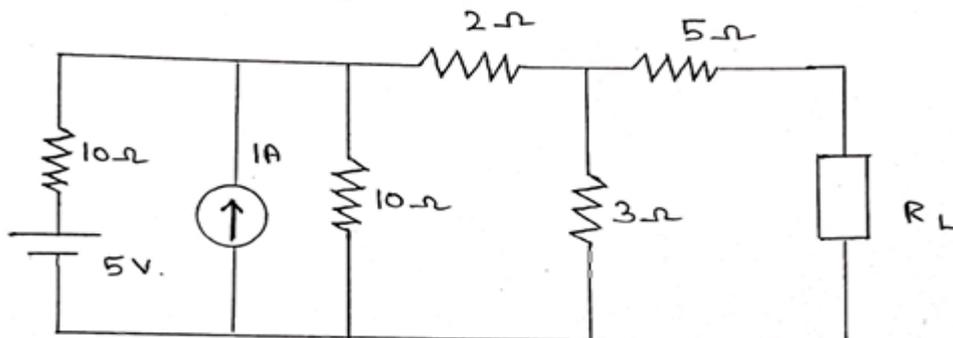


Or

- (b) Write the node voltage equations and determine the current in each branch for the network shown in fig CO2 - App (16)

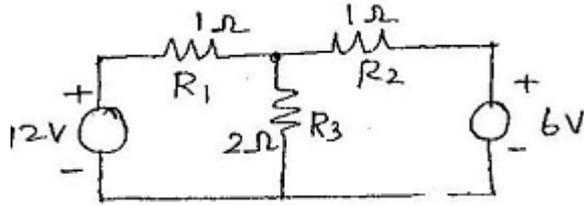


12. (a) In the circuit shown in the figure obtain the condition from maximum power transfer to the load R_L . Hence determine the maximum power transferred. CO3 - App (16)



Or

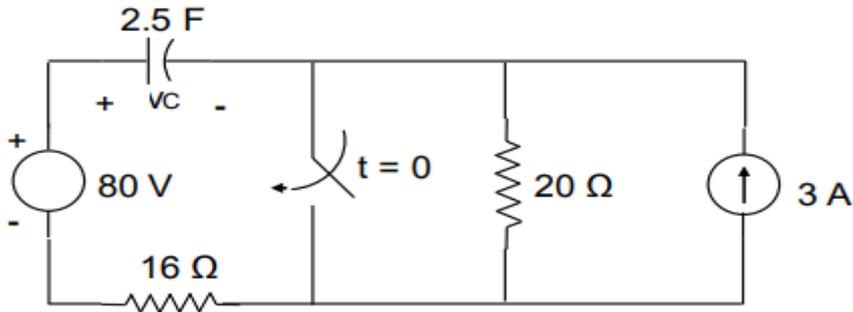
- (b) Determine the current through the 2 ohm resistor in the following network using Thevenin's theorem CO3 -App (16)



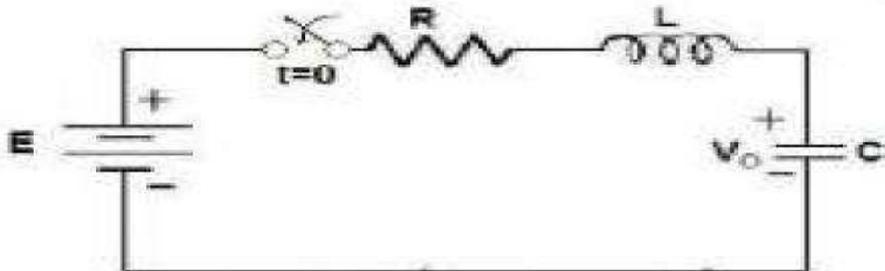
13. (a) A series RLC circuit consists of $R=100$ ohm, $L = 0.02$ H and $C = 0.02$ microfarad. Calculate frequency of resonance. A variable frequency sinusoidal voltage of constant RMS value of 50V is applied to the circuit. Find the frequency at which voltage across L and C is maximum. Also calculate voltage across L and C is maximum. Also calculate voltages across L and C at frequency of resonance. Find maximum current in the circuit. CO4 -Ana (16)

Or

- (b) Consider the circuit shown. The switch was in open position for a long time. It is operated as shown. Compute and plot the capacitor voltage for $t > 0$. Also find the time at which the capacitor voltage is 50 V. CO4 -Ana (16)



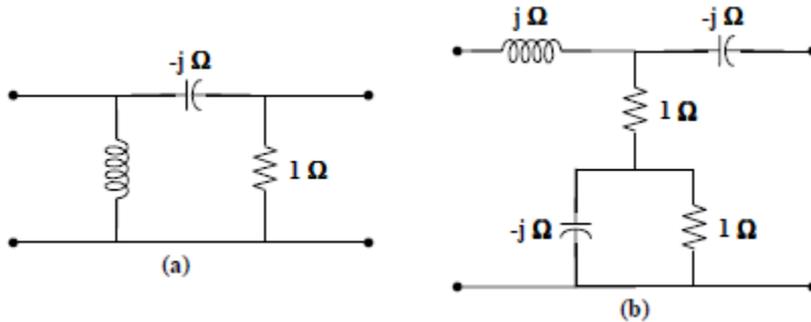
14. (a) A step voltage $V(t) = 100 u(t)$ is applied to a series RLC circuit with $L=10$ H, $R=2$ ohm and $C=5$ F. The initial current in the circuit is zero but there is an initial voltage of 50V on the capacitor in a direction which opposes the applied source. Find the expression for the current in the circuit. If the initial voltage is 100V what will be the change in current. CO5 - Ana (16)



Or

- (b) A Series RLC circuits has $R=50$ ohm, $L= 0.2H$, and $C = 50$ microfarad. CO5 - Ana (16)
 Constant voltage of 100V is impressed upon the circuit at $t=0$. Find the expression for the transient current assuming initially relaxed conditions. Analyze the current at $t= 1$ sec

15. (a) Determine the Z parameter of the two port circuit show in the figure. CO4- App (16)



Or

- (b) (i) The impedance parameters of a two-port network are $Z_{11} = 6 \Omega$; CO4- App (8)
 $Z_{22} = 4 \Omega$; $Z_{12} = Z_{21} = 3 \Omega$. Compute the Y-parameters and ABCD-parameters and write the describing equations.
- (ii) For a given, $Z_{11} = 3\Omega$; $Z_{12} = 1 \Omega$; $Z_{21} = 2 \Omega$, and $Z_{22} = 1 \Omega$, find the CO4- App (8)
 admittance matrix, and the product of Δy and Δz .