

B.E. DEGREE EXAMINATIONS: NOVEMBER 2009

Second Semester

ELECTRONICS AND COMMUNICATION ENGINEERING

U07EC201: Circuit Analysis

Time: Three hours

Maximum Marks: 100

Answer ALL the Questions:-

PART A (10 x 1 = 10 Marks)

1. If one of the resistors in a parallel circuit is removed, what happens to the total resistance?
A) Decreases B) Increases
C) Remains constant D) Exactly doubles
2. The total power in a series circuit is 10W. There are five equal value resistors in the circuit. How much power does each resistor dissipate?
A) 10W B) 5W C) 2W D) 1W
3. Norton's equivalent circuit consists of
A) Voltage source in parallel with resistance
B) Voltage source in series with resistance
C) Current source in series with resistance
D) Current source in parallel with resistance
4. Three equal resistance of 3Ω are connected in star. What is the resistance in one of the arms in an equivalent delta circuit?
A) 10Ω B) 3Ω C) 9Ω D) 27Ω
5. In a pure capacitor, the current
A) is in phase with the voltage B) is out of phase with the voltage
C) leads the voltage by 90° D) lags the voltage by 90°
6. While applying Thevenin's theorem, the Thevenin's voltage is equal to
A) short circuit voltage at the terminals
B) open circuit voltage at the terminals
C) voltage of the source
D) total voltage available in the circuit
7. The time constant of a series RC circuit is
A) $1/RC$ B) R/C C) RC D) e^{-RC}
8. The phase angle of a series RLC circuit at resonance is
A) 0° B) 90° C) 45° D) 60°

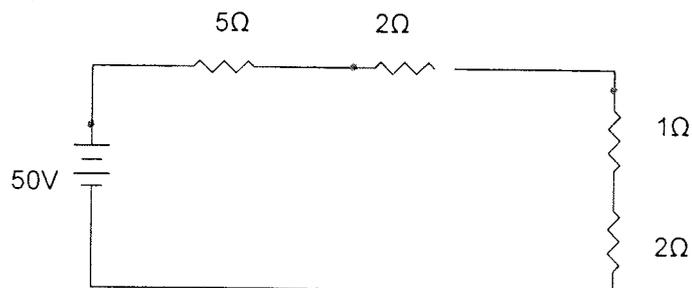
9. Dot convention in coupled circuits is used
- to measure the mutual inductance
 - to determine the polarity of the mutually induces voltage in coils
 - to determine the polarity of the self induced voltage in coils
 - to measure self inductance
10. For a perfect coupling the co-efficient of coupling is equal to
- A) 0 B) 1 C) ∞ D) 0.5

PART B (10 x 2 = 20 Marks)

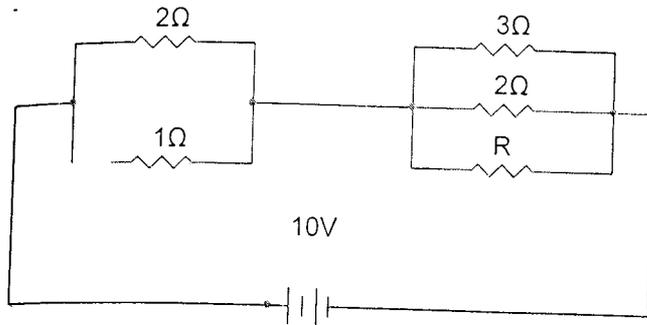
- State Kirchoff's laws.
- Define resistivity. Give its unit.
- State Thevenin's theorem.
- Three resistors R1, R2 and R3 are connected as a delta network. Convert it into a star network.
- Define the following
(a) RMS value (b) Average value
- An RLC circuit consists of 1000Ω resistor, an inductance of 100mH and capacitance of $10\mu\text{F}$. Determine its Q factor.
- The RC circuit has resistance of 10Ω and capacitance of $100\mu\text{F}$. It has an initial charge $Q_0 = 2 \times 10^{-2}$ coulomb. Find the transient current if the switch is closed at $t = 0$.
- What do you mean by transient response and forced response?
- Two inductively coupled coils have self inductances $L_1 = 50\text{mH}$ and $L_2 = 200\text{mH}$. If the coefficient of coupling is 0.5, find the value of mutual inductance between the coils.
- What is cut-set?

PART C (5 x 14 = 70 Marks)

21. a) (i) Determine the total amount of power in series circuit in fig.



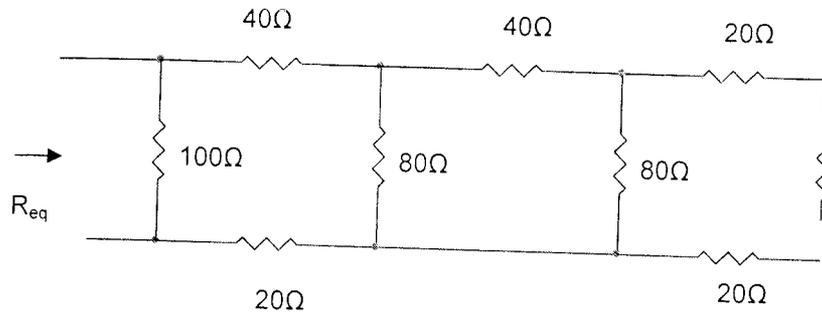
- (ii) In the circuit shown in fig. the power consumed in the 3Ω resistor is 12 watts. Find the value of R.



(8)

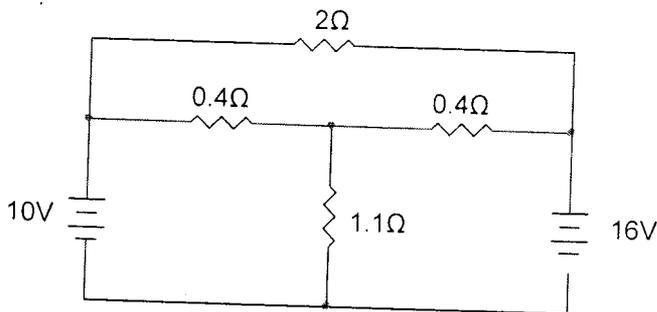
(OR)

- (b) (i) Determine the equivalent resistance.



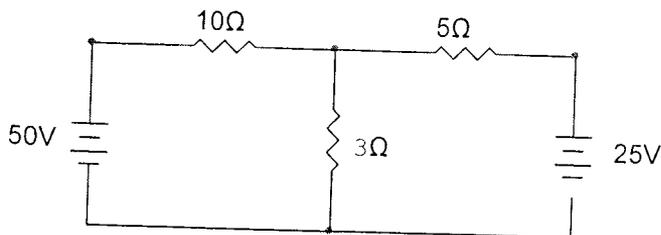
(6)

- (ii) Find the power delivered by the batteries.



(8)

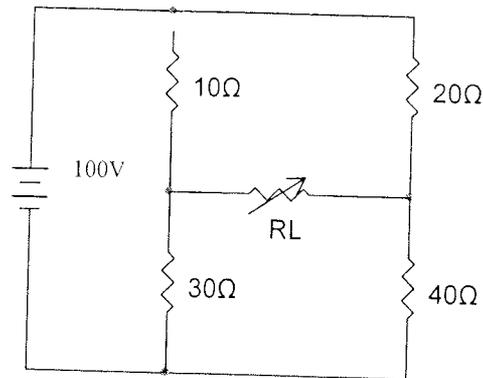
22. a) For the resistive network shown in fig, find the current in each resistor, using superposition principle.



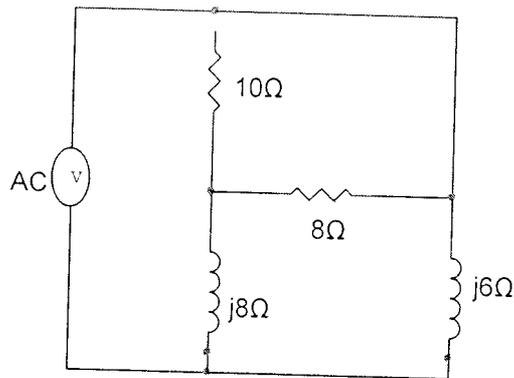
(6)

(OR)

- b) Determine the load resistance to receive maximum power from the source; also find the maximum power delivered to the load in the circuit shown in fig.

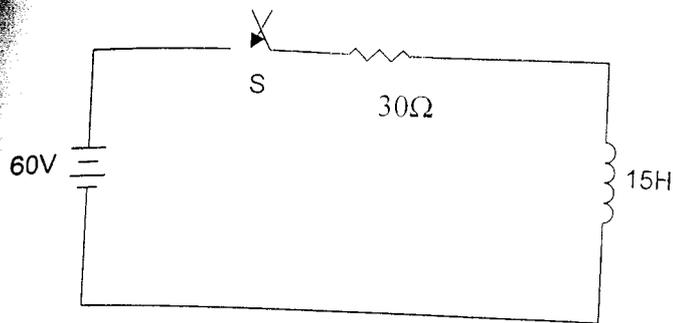


23. a) In the fig shown below, find the value of V such that the power in the $8\ \Omega$ resistor is 200 watts.

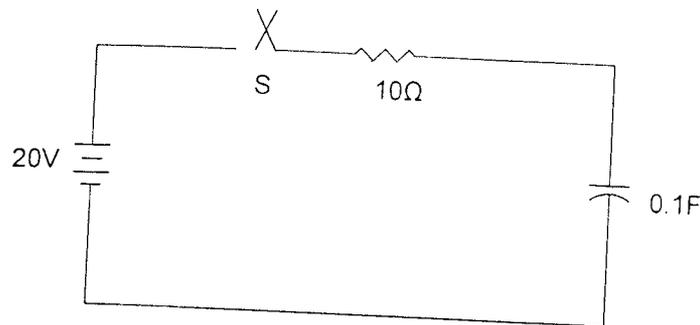


(OR)

- b) (i) Derive the equation for Average power.
(ii) A sinusoidal voltage $v = 50 \sin \omega t$ is applied to a series RL circuit. The current in the circuit is given by $i = 25 \sin (\omega t - 53^\circ)$. Determine
(1) apparent power.
(2) power factor.
(3) average power.
24. a) (i) A series RL circuit with $R = 30\ \Omega$ and $L = 15\ \text{H}$ has a constant voltage $V = 60\ \text{V}$ applied at $t = 0$ as shown in fig. Determine the voltage across the inductor.



- (i) A series RL circuit consists of resistor of 30Ω and inductor of $15H$ as shown in fig. A constant voltage of $60V$ is applied to the circuit at $t = 0$. Determine the current through the inductor at $t = 0.1s$.

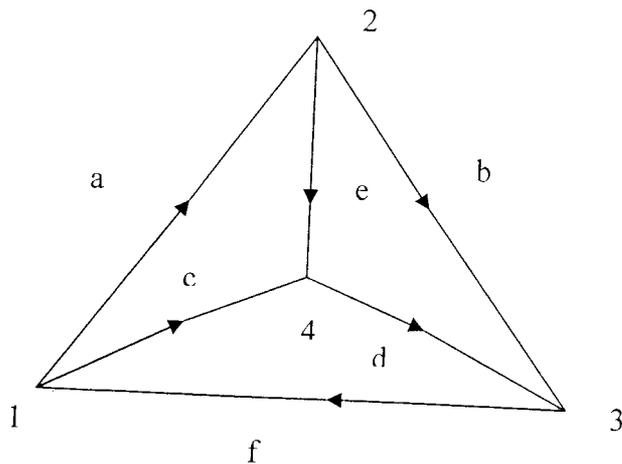


(7)

(OR)

- b) (i) Derive an expression for the resonance frequency of a parallel resonance circuit. (6)
 (ii) A series circuit with $R = 10\Omega$, $L = 0.1H$ and $C = 50\mu F$ has an applied voltage $V = 50\angle 0^\circ$ with a variable frequency, the value of frequency at which maximum voltage occurs across the inductor and the value of frequency at which maximum voltage occurs across the capacitor. (8)

25. a) (i) Describe briefly about the duality principle in networks. (4)
 (ii) For the given graph shown in fig draw the number of possible trees. (10)



(10)

(OR)

- b) For the electrical network shown in fig draw its topological graph and write incidence matrix, tie-set matrix, link current transformation equation and branch currents.

