

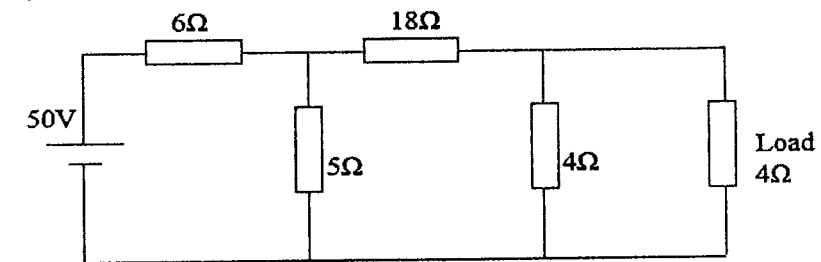
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October 2024

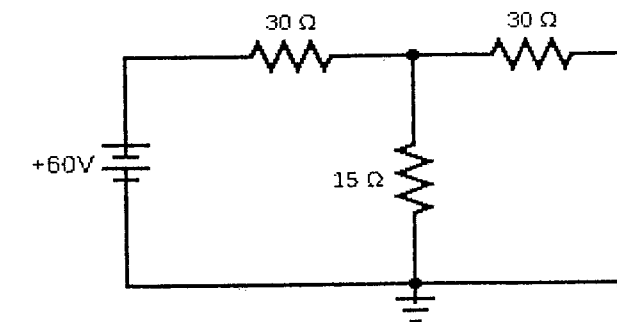
Time - Three hours  
(Maximum Marks: 100)

**[N.B.]** [Answer all the questions, choosing any two subdivision from each question. Each subdivision carries 10 marks.]

1. (a) Derive the equivalent resistance when three resistors are connected (i) in series (ii) in parallel.
- (b) Find the current in the  $4\Omega$  load resistor in the circuit shown below by mesh analysis.

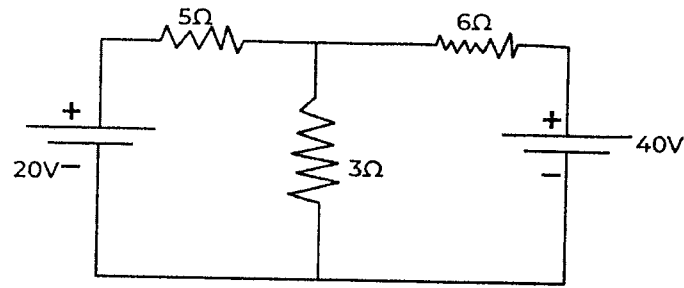


- (c) Derive an expression for delta to star transformation.
- (d) Using nodal analysis determine the current flowing through the  $15\Omega$  resistor.

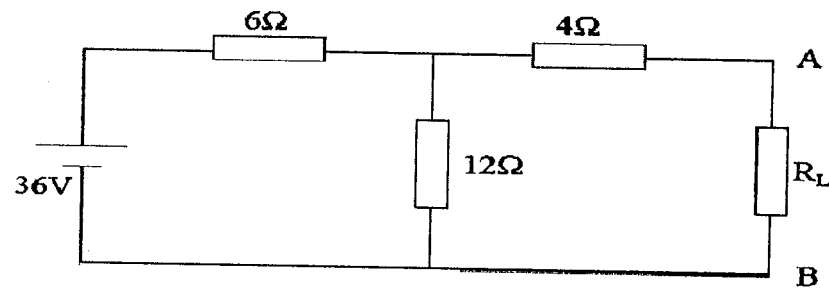


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2. (a) Using superposition theorem, find the current passing through the  $3\Omega$  resistor.



- (b) State Norton's theorem. Also write its step by step procedure.  
 (c) For the circuit shown below, find the value of  $R_L$  for which the maximum power is transferred from the source.



- (d) Explain about Thevenin's theorem with an example.
3. (a) Derive an expression for effective (RMS) value of sinusoidal wave in terms of its maximum value.  
 (b) A coil of resistance  $8\Omega$ , an inductance of  $0.1H$  and a capacitance of  $75\mu f$  is connected in series across a  $230V$   $50Hz$  supply. Find (i) current in the circuit (ii) power factor.  
 (c) A two element series circuit of  $R=10\Omega$  and  $X_L=15\Omega$  has an effective voltage of  $230V$  at  $50Hz$ . Determine the active power and apparent power.  
 (d) Define the following terms: Form Factor, Peak factor, Impedance, Phase angle and Power factor.

4. (a) Derive an expression for bandwidth in parallel resonance circuit.  
 (b) Two impedances  $Z_1 = 10-j8$  Ohms and  $Z_2 = 7+j2$  Ohms are connected in parallel across  $230V$ ,  $50Hz$  supply. Find the total impedance.  
 (c) Derive expressions for half power frequencies in series resonant circuit.  
 (d) Discuss about the effects of varying inductance and capacitance in series RLC circuit.
5. (a) A balanced delta connected load of  $4+j8$  Ohms per phase is connected to a 3 phase  $400V$  supply. Find the line current, power and total volt ampere.  
 (b) A three phase  $440V$  load operates with a power factor of  $0.7$ . The total power taken from the mains is  $60kW$ . Two Watt meters are connected to measure the input power. Find the readings of each Wattmeter.  
 (c) Discuss about delta connected unbalanced loads.  
 (d) Derive the relation between voltages and currents of line and phase values in star connected systems.

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