

N.B.: (1) Question No. 1 is compulsory.

(2) Attempt in all five questions (including question No. 1).

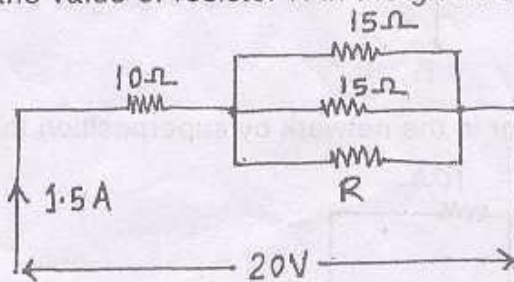
(3) Figures to the right indicate full marks.

(4) Assume suitable data if necessary and give justification.

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Master

1. (a) Find the value of resistor R in the given circuit.

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(b) Derive emf equation of a transformer from the first principles.

(c) Why single phase induction motor is not self starting ?

(d) What is ripple factor ? What is the requirement of a rectifier in terms of ripple factor ? How is it achieved ?

(e) In an R-L-C series circuit, the voltage across the resistor, inductor and capacitor are 10 V, 15 V and 10 V respectively. What is the supply voltage ?

2. (a) Each phase of a three-phase delta connected load has an impedance of  $10 \bar{Z}_{ph} = (50 \angle 60^\circ) \Omega$ . The line voltage is 400 V. Calculate the power consumed by each phase and the total power. What will be the readings of the two wattmeters connected to measure the power ?

(b) The instantaneous voltages across each of four series-connected coils are given by :

$$v_1 = 100 \sin \omega t$$

$$v_2 = 250 \cos \omega t$$

$$v_3 = 150 \sin (\omega t + \pi/6)$$

$$v_4 = 200 \sin (\omega t + \pi/4)$$

Find the total potential difference (pd) and express the answer in similar form. What will be the resultant pd if the polarity of  $v_2$  is reversed.

3. (a) Draw the experimental set-up to obtain the characteristics of a n-p-n transistor in the CE configuration. Draw and explain the input and output characteristics of a n-p-n transistor in the CE configuration. Also indicate the various regions of operation on the characteristics. 10

(b) What is transducer ? Explain the construction and working of LVDT. 5

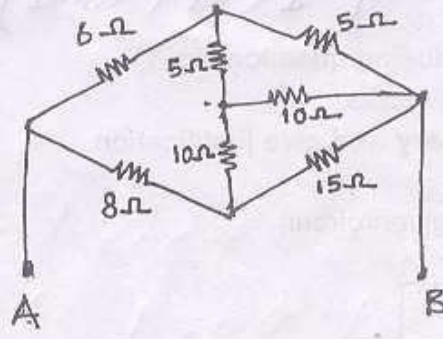
(c) Draw and explain SCR characteristics with different parameters. 5

4. (a) Explain with neat diagram, construction and working of permanent magnet moving coil instrument. What are the advantages of these instruments ? 6

(b) A 4-pole, d.c. shunt motor has lap connected armature winding. The flux per pole is 30 m Wb. The number of armature conductor is 250. When connected to 230 V d.c. supply it draws an armature current of 40 A. Calculate the back emf and the speed with which motor is running. Assume armature resistance is 0.6 Ω. 6

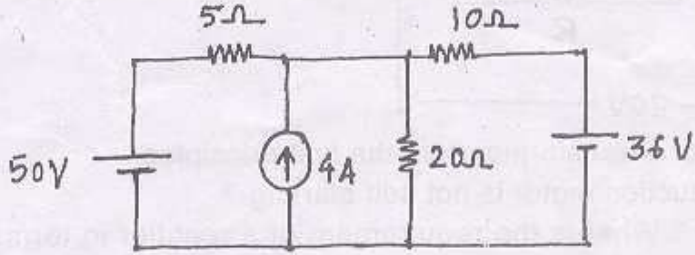
(c) A 30 kVA, 2400/120 V, 50 Hz, transformer has a high voltage winding resistance of 0.1Ω and leakage reactance of 0.22Ω. The low voltage winding resistance is 0.035Ω and the leakage reactance is 0.012Ω. Calculate for the transformer (i) Equivalent resistance as referred to both primary and secondary (ii) Equivalent reactance as referred to both primary and secondary (iii) Equivalent impedance as referred to both primary and secondary (iv) Cu loss at half load and 75% full load. 8

5. (a) Find the equivalent resistance across terminals A and B in the given circuit.



(b) Determine the current in 5Ω resistor in the network by superposition theorem :

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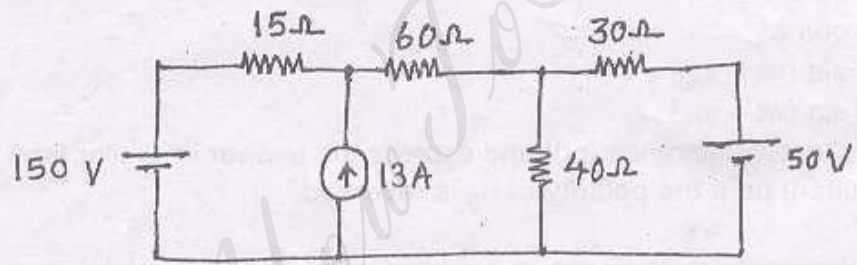
(c) A current of 5A flows through a non-inductive resistance in series with a coil supplied at 250 V, 50Hz supply. If the voltage across the resistance is 125 V and across the coil 200 V. Calculate :

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- (i) Impedance, reactance and resistance of the coil
  - (ii) Power absorbed by the coil
  - (iii) Power factor of the coil
- Also draw phasor diagram.

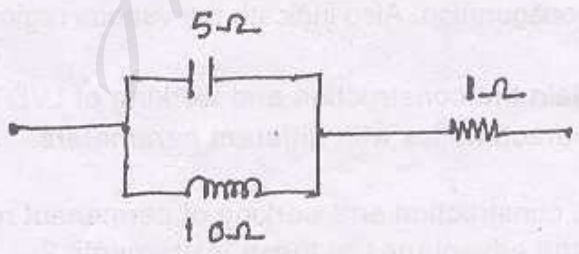
6. (a) State Thevenin's theorem. By using Thevenin's theorem, find the current through 30Ω resistor in the given network :

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(b) Draw the admittance triangle of the given circuit :

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(c) Determine the parameter of an R-L-C series circuit that will resonate at 10,000 Hz, has a bandwidth of 1000 Hz and draws 15.3 W from a 200 V supply, operating at the resonant frequency of the circuit.

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7. Write short notes on :-

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- (a) Moving iron meters
- (b) D. C. series motor
- (c) Pressure transducers
- (d) Two wattmeter method for measurement of 3-φ power.