

Time: 03 hours

Max. Marks: 80

Note to the students: -1) Q1 is compulsory.

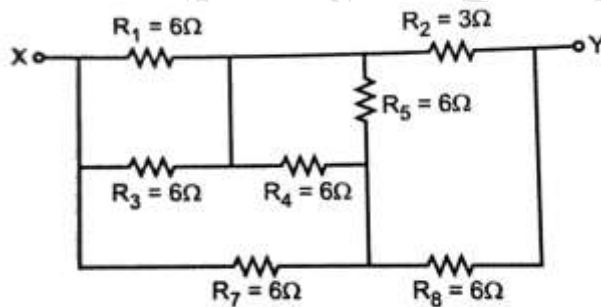
2) Solve any Three questions from the remaining Five questions.

Q1 Solve any Four

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- a) Using delta-star transformation, find resistance between X & Y.

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- b) A sinusoidally varying alternating current has a peak value of 9.2 A and a frequency of 50 Hz. What will be the instantaneous value at  
 (i) 0.003 sec after passing through zero in the positive direction &  
 (ii) 0.0045 sec after passing through its positive peak value.
- c) A coil draws 10 A current and takes 1000 W power from a 220 V, 50 Hz A.C supply. Find (i) Impedance (ii) Power Factor (iii) Reactive and Apparent Power.
- d) Explain the principle of operation of DC motors.
- e) Explain the construction and working of single phase transformer.

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Q2 Solve any Four

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- a) State and derive the condition for Maximum Power transfer.
- b) Prove that the power consumed by pure inductor is zero.
- c) A capacitor of 35 μF is connected in series with a variable resistor. The circuit is connected across 50 Hz mains. Find the value of the resistor for a condition when the voltage across the capacitor is half the supply voltage.
- d) 1000/230 V, 15 KVA, 50 Hz, 1-phase transformer has a core loss of 1.4 kW and full load copper loss 1.6 kW. Find the efficiency at half full load at 0.8 p.f lagging.
- e) Derive the expression to convert delta network to its equivalent star network.

Q3 Solve any Two

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- A resistance of 20 ohms and a pure inductance of 0.2 H is connected in parallel with 200  $\mu$ F capacitor with variable frequency, 230 V supply. Find the resonant frequency and the total current from the supply.
- Show that  $I_L = \sqrt{3} I_{ph}$  for three phase delta connection. Draw the necessary phasor diagram.
- State and explain the Thevenin's theorem with an example.

Q4 Solve any Two

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- Draw and explain the phasor diagram of Transformer for inductive load.
- A delta connected load draws a line current of 15 A at lagging p.f of 0.85 from a 400 V, 50 Hz, 3-phase supply. Find the resistance and inductance of each phase. If the same load is now connected in star, calculate the line current and total power consumed.
- The following results were obtained on a 40 KVA, 2400/120 V, 50 Hz transformer are as under:

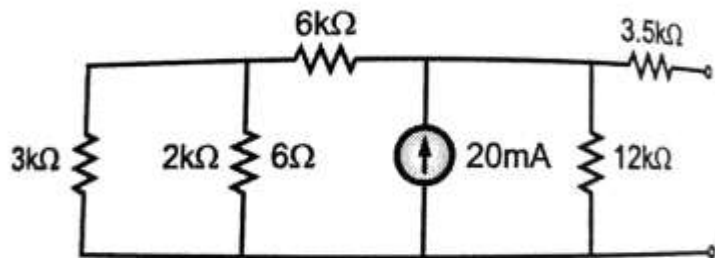
OC test (LV side):	120 V	9.56 A	396 W
SC test (LV side):	92 V	20.8 A	810 W

Calculate the parameters of approximate equivalent circuit referred to H.V side.

Q5 Solve any Two

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- Reduce given circuit into a voltage source in series with a single resistance.



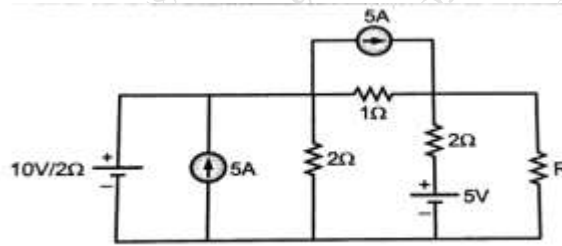
- If two impedances  $Z_1 = (10+j5) \Omega$  and  $Z_2 = (6 - j8) \Omega$  are connected in parallel with each other. The total current supplied is  $I_y = 15$  A. What is the power taken by each branch?
- Derive the formula for resonant frequency of the circuit with a pure capacitor in parallel with a coil having resistance and inductance.

Q6

Solve any Two

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- a) Find the value of  $R_L$  for abstracting maximum power. Also find the maximum power.



- b) A coil takes a current of  $1 A$  at  $0.3$  p.f lagging when connected to a  $100 V, 50$  Hz supply. Determine the value of a capacitance which when connected in parallel with the coil will reduce the supply current to a minimum. Also calculate the impedance of the parallel circuit at this condition of minimum current.
- c) Draw the equivalent circuit of transformer with primary referred to secondary. State the formula of each and every element shown in the equivalent circuit.

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