

(3 Hours)

Total Marks: 80

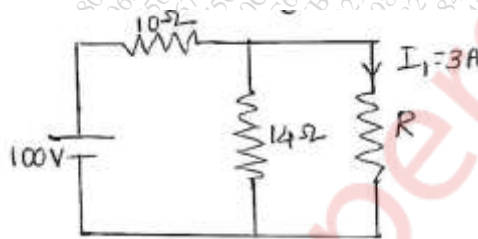
N. B.1) Question No. 1 is **compulsory**.

- 2) Answer any **3** questions from the remaining **5** questions.
- 3) Assume suitable data wherever necessary.

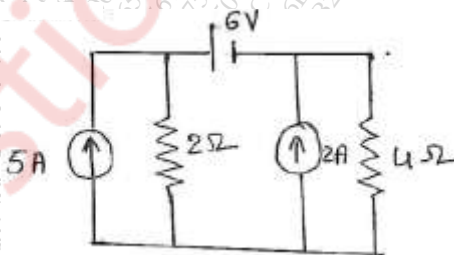
Q1 Attempt any **five** of the following

**20**

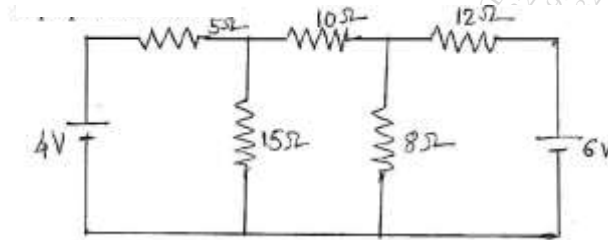
- (a) Explain the working principle of Single Phase Transformer.
- (b) Derive the formula to convert a Star circuit into equivalent Delta.
- (c) Explain the principle of operation of DC motor.
- (d) What is the necessary condition for resonance in series circuit? Derive the expression for resonance frequency.
- (e) Find the value of R in the following circuit.



- (f) Find the current through 4Ω resistor by source transformation in the following circuit;



- Q2 a) Determine the current through  $8\Omega$  resistor in the following Network by superposition theorem; 8

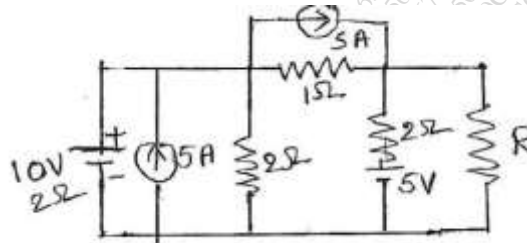


- (b) An Inductive coil having inductance of  $0.04\text{H}$  and resistance  $25\Omega$  has been connected in series with another inductive coil of inductance  $0.2\text{H}$  and resistance  $15\Omega$ . The whole circuit is powered with  $230\text{V}$ ,  $50\text{Hz}$  mains. Calculate the power dissipation in each coil and total power factor. 8
- (c) What are the losses in transformer? Explain why the ratings of transformer in KVA not in KW 4
- Q3 (a) With necessary diagrams prove that three phase power can be measured by only two wattmeters. Also prove that reactive power can be measured from the wattmeter reading. 10
- (b) An alternating voltage is represented by  $v(t) = 141.4 \sin(377t)$  V, Derive the RMS value of the voltage. 10
- Find
- Instantaneous voltage value at  $t = 3\text{ms}$
  - The time taken for voltage to reach  $70.7$  V for first time.

- Q4 (a) State and prove Maximum power transfer Theorem. 8
- (b) A  $5\text{KVA}$   $1000/200\text{V}$ ,  $50$  Hz Single phase transformer gave the following test result 12
- |                    |                |                |               |
|--------------------|----------------|----------------|---------------|
| OC TEST (hv side): | $1000\text{V}$ | $0.24\text{A}$ | $90\text{W}$  |
| SC TEST (hv side): | $50\text{V}$   | $5\text{A}$    | $110\text{W}$ |
- Calculate
- Equivalent circuit for transformer with circuit constant
  - Regulation at full load at  $0.8$  lagging
  - kVA load for maximum efficiency.

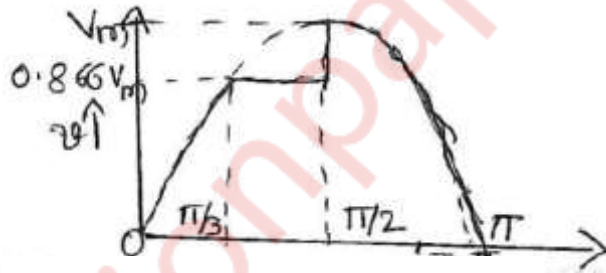
- Q5 (a) Three similar coils each having a resistance of  $10\Omega$  and inductance  $0.04\text{H}$  are connected in star across 3-phase  $50\text{Hz}$ ,  $200\text{V}$  supply. Calculate the line current, total power absorbed, reactive coil amperes and total volt amperes. 8

- (b) In the following circuit find R for maximum power delivered to it. Also find maximum power delivered  $P_{max}$ .



- (c) Two impedances  $12+j16\Omega$  and  $10-j20\Omega$  are connected in parallel across 230V, 50Hz Single phase ac supply. Find kW, kVA and kVAR and Power factor.

- Q6 (a) Draw and Explain the phasor diagram for the practical transformer connected to lagging power factor.  
 (b) Find i) average value ii) rms value.



- (c) State and Explain Thevenin's theorem and Norton's theorem