

(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

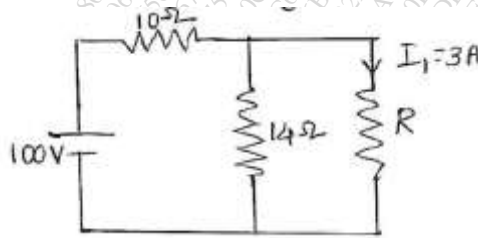
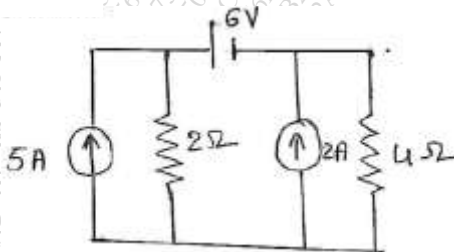
(a) Explain the working principle of Single Phase Transformer.

(b) Derive the formula to convert a Star circuit into equivalent Delta.

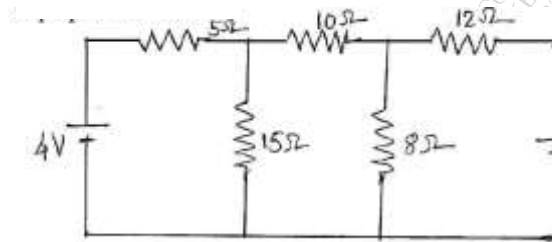
(c) Explain the principle of operation of DC motor.

(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  $4\Omega$  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  $70.7\text{ V}$  for first time.
- Q4 (a) State and prove Maximum power transfer Theorem. 8

- (b) A  $5\text{KVA}$   $1000/200\text{V}$ ,  $50\text{ Hz}$  Single phase transformer gave the following test result 12

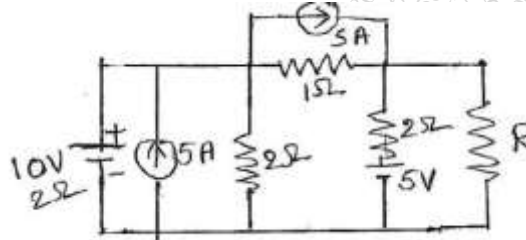
OC TEST( hv side):	$1000\text{V}$	$0.24\text{A}$	$90\text{ W}$
SC TEST(hv side) :	$50\text{V}$	$5\text{ A}$	$110\text{ W}$

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 volt amperes and total volt amperes. 8

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

8



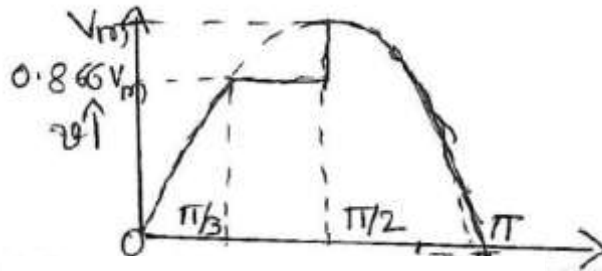
- (c) Two impedances  $12+j16\Omega$  and  $10-j20\Omega$  are connected in parallel across 230V, 50Hz Single phase ac supply. Find kW, kVA and kVAR and Power factor.

4

- 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.

6

10



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

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