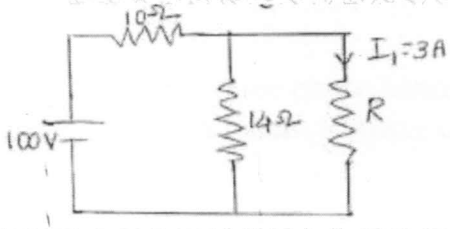
(3 Hours) **Total Marks: 80**

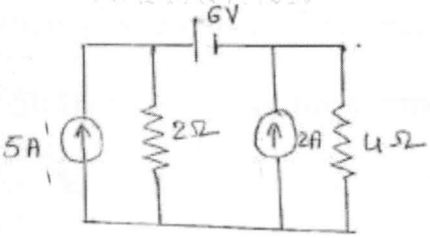
N. B.1) Question No. **1** is **compulsory**.
2) Answer any **3** questions from the remaining **5** questions.
3) Assume suitable data wherever necessary.

Q1 Attempt any ***five*** of the following **20**

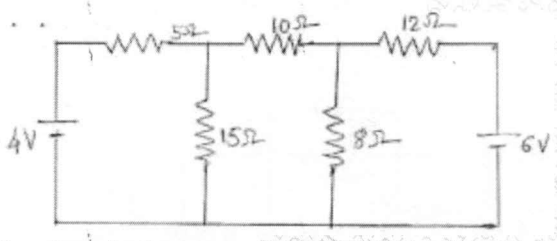
(a) Explain the working principle of Single Phase Transformer.
(b) Derive the formula to convert a Star circuit into equivalent Delta.
(c) Explain the principle of operation of DC motor.
(d) What is the necessary condition for resonance in series circuit? Derive the expression for resonance frequency.
(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 8Ω resistor in the following Network by superposition theorem; **8**



(b) An Inductive coil having inductance of 0.04H and resistance 25Ω has been connected in series with another inductive coil of inductance 0.2H and resistance 15Ω. The whole circuit is powered with 230V, 50Hz mains. Calculate the power dissipation in eachcoil 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 canbe 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

i) Instantaneous voltage value at t=3ms

ii) 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 5KVA 1000/200V, 50 Hz Single phase transformer gave the following test result **12**

OC TEST(hv side):	1000V	0.24A	90 W
SC TEST(hv side) :	50V	5 A	110 W

Calculate

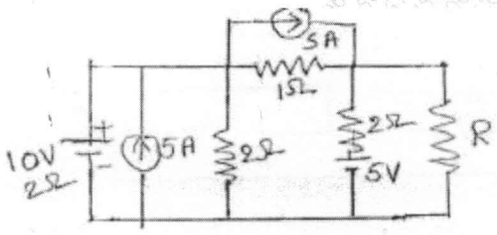
i. Equivalent circuit for transformer with circuit constant

ii. Regulation at full load at 0.8 lagging

iii. kVA load for maximum efficiency.

Q5 (a) Three similar coils each having a resistance of 10Ω and inductance 0.04 H are connected in star across 3-phase 50Haz, 200V supply. Calculate the line current, total power absorbed, reactive colt amperes and total volt amperes. **8**

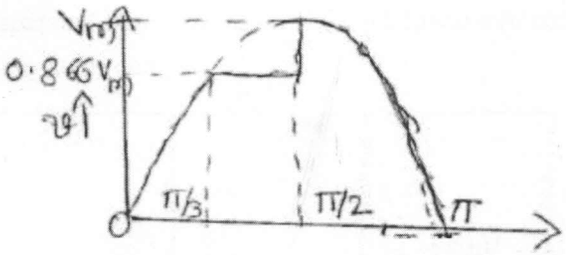
(b) In the following circuit find R for maximum power delivered to it. Also find maximum power delivered P_{max}. **8**



(c) Two impedances 12+j16Ω and 10-j20Ω 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. **6**

(b) Find i) average value ii) rms value. **10**



c) State and Explain Thevenin's theorem and Norton's theorem **4**