FE SemI (R-2019 C Scheme) "All Branches" Dec' 2023

22|12|2023

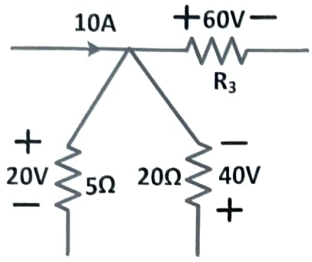
Time: 3 Hours **Total Marks: 80**

1. **Q.1 is compulsory**
2. **Answer any three out of the remaining questions**
3. **Assumptions made should be clearly stated**

I. **Answer any four**

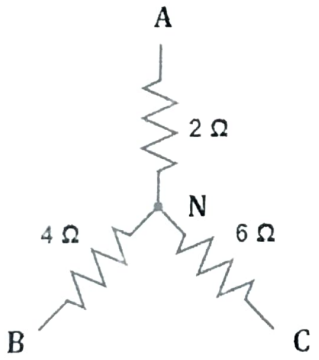
(a) An inductor of 0.2H and resistance of 10Ω are connected in series to a 230V(RMS),50Hz sinusoidal supply. Calculate (i)reactance of the inductor, (ii)impedance of coil, (iii)RMS value of current, (iv) RMS value of voltage across resistance and (v)maximum current. **05**

(b) Find value of R_3 in the figure given below by applying Ohm's law and Kirchhoff's laws. **05**



(c) Draw a neat diagram of two wattmeter method of power measurement in three phase circuits for resistive load and state any two advantages. **05**

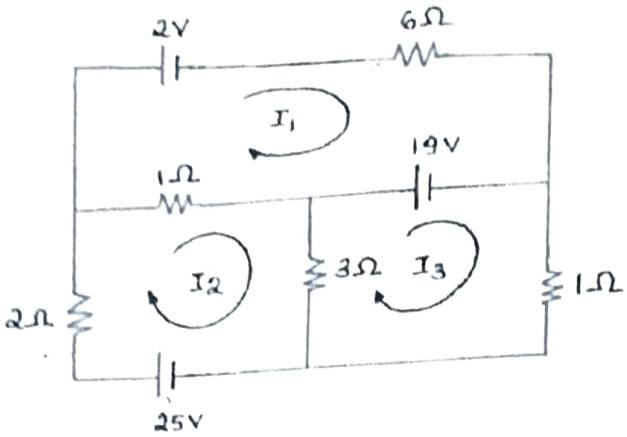
(d) Draw the equivalent delta network. Mention the formula used for the conversion. **05**



(e) Compare core type and shell type single phase transformer. **05**

II. A) Prove that the power in a balanced three phase circuit can be deduced from the readings of the wattmeters in two wattmeter method of power measurement. How to find reactive power from these wattmeter readings? **10**

B) Find the currents I_1, I_2, I_3 and the current through 3Ω using mesh analysis? **10**



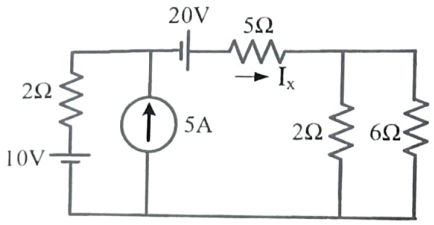
III. A) A coil having a resistance of 5Ω and an inductance of 0.1H is connected in series with a 50-μF capacitor. An alternating voltage of 200V is applied to the circuit. At what value of frequency will the current be a maximum? Calculate the following for this frequency: (i) impedance of the circuit and current; (ii) reactance of inductor and reactance of capacitor, (iii) voltages across coil and voltages across capacitor, (iv) voltage magnification across capacitor with respect to the supply voltage. 10

B) An alternating voltage is represented by v(t)=141.4 sin (377t) V. Find (i) RMS value of voltage;(ii) frequency in Hz, (iii) time period in sec.;(iv) instantaneous value of voltage at t=3ms and (v) the time taken for the voltage to reach 70.7V for the first time. 10

IV. A) A balanced load of phase impedance 100Ω and power factor 0.8 is connected in delta to a 400 V, 3-phase supply. Calculate (i) resistance and reactance per phase; (ii) line current; (iii) active power; (iv) reactive power and (v) apparent power. 10

B) State different parts of a three-phase induction motor and mention the function of each part. What are the two types of induction motor? 10

V. A) Find the current through 5Ω (I_x) using Superposition theorem. 10



B) Two impedances 14+j5Ω and 18+j10Ω are connected in parallel across 200V, 50 Hz, single phase supply. Determine: (i) Admittance of each branch in polar form;(ii) Current in each branch in polar form; iii) power factor of each branch.; (iv)active power in each branch and (v) reactive power in each branch. 10

VI. A) Find the value of the resistance R using maximum power transfer theorem and find the value of maximum power transferred. 10

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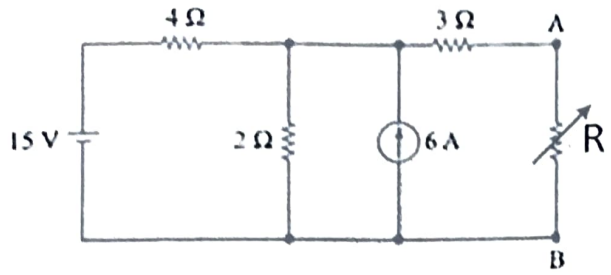

B) i) Derive the emf equation of a single-phase transformer. **05**

ii) Find the number of turns on the secondary and value of flux in a 25kVA, 3000/240V single phase transformer with 500 turns on the primary. The primary winding is connected to 3000V, 50Hz supply. Neglect all voltage drops. **05**

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