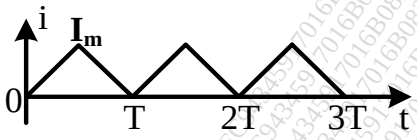
(Three Hours) **(Marks :80)**

N.B: (1) Question No.1 is compulsory.
(2) Answer any THREE from the remaining five questions.
(3) Assume suitable data if required and state the assumption.

Q1. Answer any five.

(i) Find the RMS value of the waveform given below. (4)



(ii) State Norton's theorem and draw the Norton's equivalent circuit. (4)

(iii) In an R-L-C parallel circuit the current through the resistor, inductor (pure) and capacitor (pure) are 20 A, 15 A and 40 A respectively. What is the current taken from the supply? Draw the phasor diagram. (4)

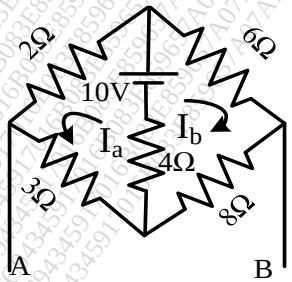
(iv) A balanced 3-Φ, star-connected load consists of three coils each consisting of R=6Ω and X_L=8Ω.Determine the line current, power factor when the load is connected across 400 V,50 Hz supply. (4)

(v) Briefly explain the classification of dc machine. (4)

(vi) Draw the phasor diagram of a single phase transformer when it is loaded with a lagging power factor load. (4)

Q2. **(A)** Prove that the average power taken by a pure capacitor fed with a sinusoidal ac supply in a cycle is zero. (10)

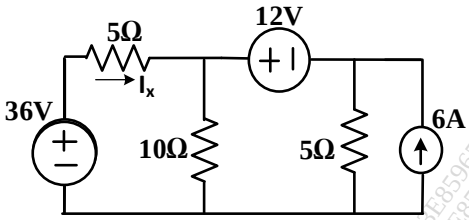
(B) Using mesh analysis find the mesh currents in the direction shown and also find the voltage across A and B terminals. (10)



Q3. **A)** A single phase transformer has 1000 turns on the primary and 200 turns on the secondary. The no load current is 3A at a power factor of 0.2 lag and the secondary current is 280A at a power factor of 0.8 lag. Neglect R_2 and X_2. Calculate (i)Magnetizing component and loss component of no load current; (ii)Primary current (iii) Input power factor. Draw the phasor diagram showing all these currents. (10)

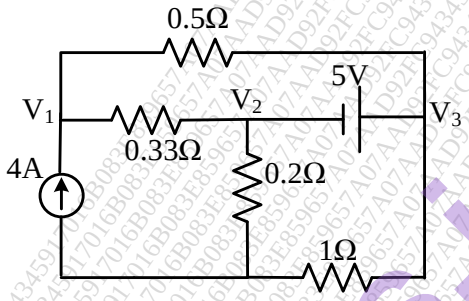
(B) Derive the formula for resonant frequency of the circuit with a pure capacitor in parallel with a coil having resistance and inductance. Find the expression for dynamic resistance of this parallel resonant circuit. (10)

Q4. **(A)** Find current I_x using Superposition theorem. (10)



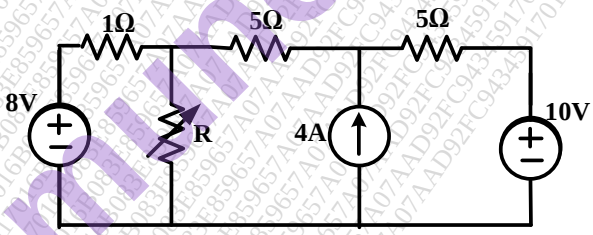
(B) A resistance and a capacitance connected in series across a 250V supply draws 5A at 50 Hz. When frequency is increased to 60 Hz, it draws 5.8A. Find the values of R & C. Also find active power and power factor in both cases. (10)

Q5. (A) Find the node voltages V_1, V_2 and V_3 and current through 0.5Ω. (10)



(B) Describe the basic principle of operation of a single phase transformer and derive the emf equation. (10)

Q6. **(A)** Determine the value of R for maximum power transfer and find the value of maximum transfer. (10)



(B) The O.C and S.C test data are given below for a single phase, 5 kVA, 200V/400V, 50Hz transformer. (10)
O.C test from LV side: 200V 1.25A 150W
S.C test from HV side: 20V 12.5A 175W
Determine the following: (i) Draw the equivalent circuit of the transformer referred to LV side (ii) At what load or kVA the transformer is to be operated for maximum efficiency? (iii) Calculate the value of maximum efficiency. (iv) Regulation of the transformer at full load 0.8 power factor lag.

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