Code: 13A02101 **R13**

B.Tech I Year (R13) Supplementary Examinations June 2016

ELECTRICAL CIRCUITS

(Electrical and Electronics Engineering)

Time: 3 hours Max. Marks: 70

PART – A

(Compulsory Question)

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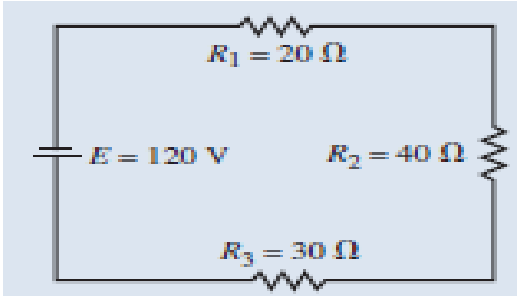
1 Answer the following: (10 X 02 = 20 Marks)

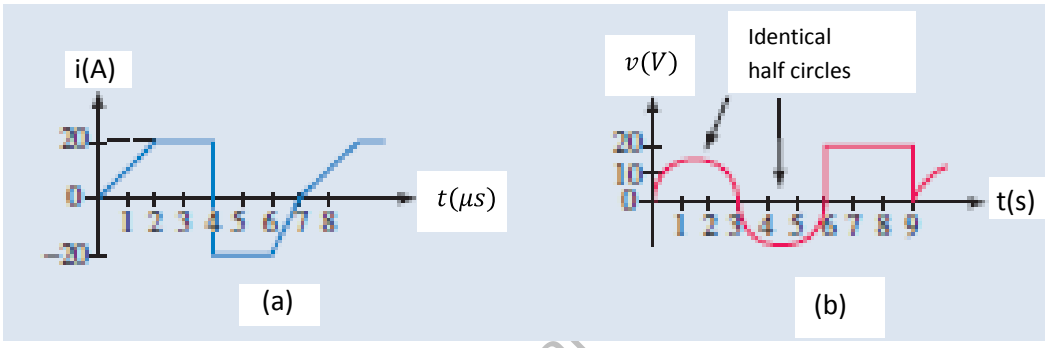
(a) Show that the power dissipated is equal to the power delivered.



(b) Define Self inductance.

(c) A voltage source has internal impedance (4+j5) ohm. Find the load impedance for maximum power transfer.

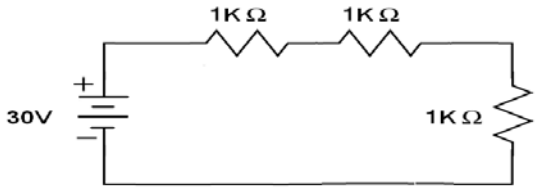
(d) Determine the averages for the circuit given below:



(e) A resistance 5 ohms, inductance 0.02 H and capacitor 5μF are connected in series. Find the resonance frequency and the power factor at resonance.

(f) Three identical resistors of 20 Ω each are connected in star to a 415 V, 50 Hz, three-phase supply, calculate the total power consumed, If they are connected in delta.

(g) Obtain the dual circuit for the below figure.



(h) State Thevenin's theorem.

(i) Define time constant for RL & RC circuits.

(j) A series RLC circuit with R = 10 Ω, L = 2 H and C = 1 F has a constant voltage of 100 V applied at t = 0. Determine the initial values of I (t) and $di(t)/dt$.

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PART – B

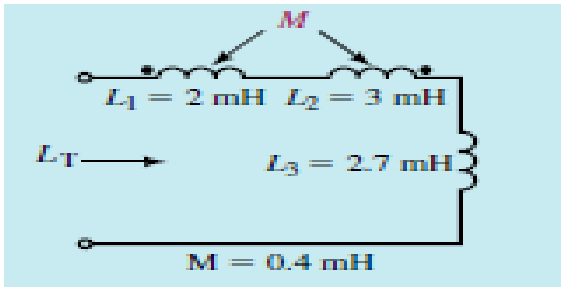
(Answer all five units, 5 X 10 = 50 Marks)

UNIT - I

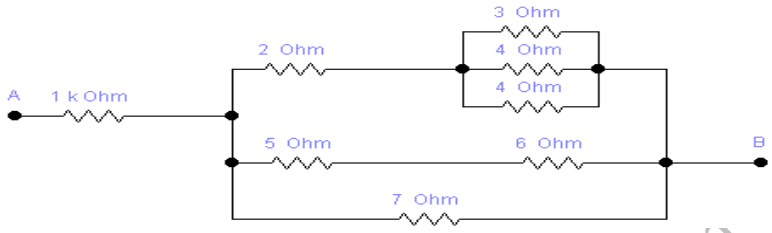
2 The number of turns in a coil is 250. When a current of 2 A flows in this coil, the flux in the coil is 0.3 mWb. When this current is reduced to zero in 2 ms, the voltage induced in a coil lying in the vicinity of coil is 63.75 volts. If the coefficient of coupling between the coils is 0.75, find self–inductance of the two coils, mutual inductance and number of turns in the second coil.

OR

3 (a) Three inductors are connected in series (Figure). Coils 1 and 2 interact, but coil 3 does not.
(i) Determine the effective inductance of each coil.
(ii) Determine the total inductance of the series connection.



(b) Find the equivalent resistance between A & B for the circuit shown in figure below.



UNIT - II

4 Derive the expression for RMS value and average value of an AC circuit.

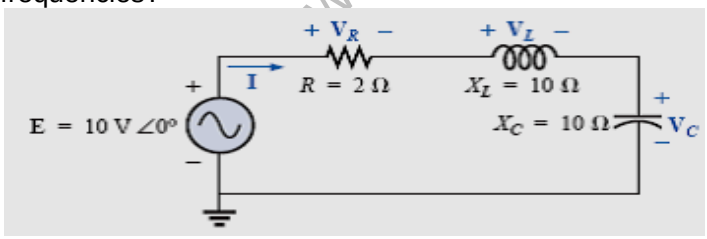
OR

5 (a) Justify the line current is equal to 1/√3 times of phase current under the balanced load condition

(b) Given $v = 20\sin(\omega t + 30°)$ and $i = 18\sin(\omega t - 40°)$, draw the phasor diagram, determine phase relationships and sketch the waveforms.

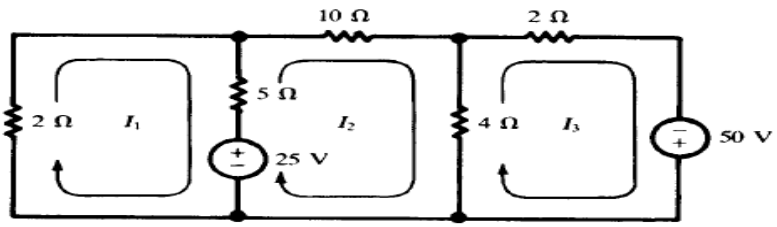
UNIT - III

6 For the series resonant circuit of figure given below:
(i) Find I, V_R, V_L, and V_C at resonance. (ii) What is the *Qs* of the circuit? (iii) If the resonant frequency is 5000 Hz, find the bandwidth. (iv) What is the power dissipated in the circuit at the half-power frequencies?



OR

7 Solve loop currents by the mesh current method.



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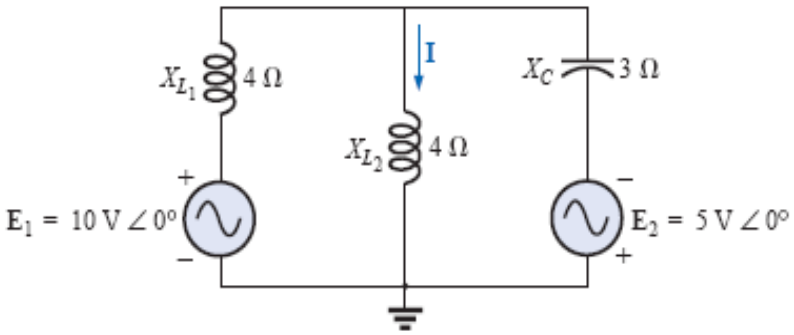
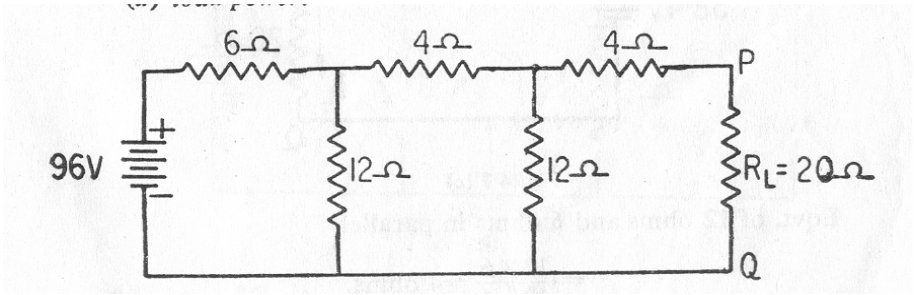
UNIT - IV

8 Using the superposition theorem, find the current I through the 4Ω (X_{L2}).



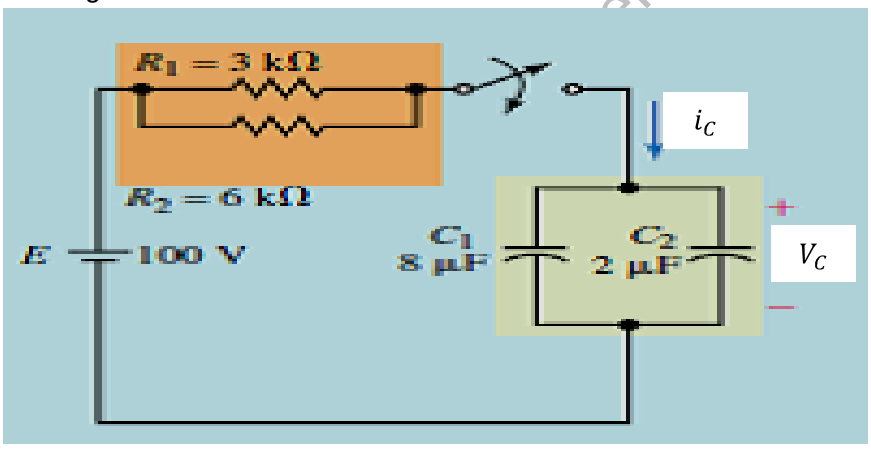
OR

9 For the following figure. Find the Thevenin equivalent circuit, load current and power consumed by load.



UNIT - V

10 For the circuit shown in figure below, determine expressions for V_C and i_C. Capacitors are initially uncharged.



OR

11 Derive the current response of series RL circuit.

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