

ELECTRICAL CIRCUITS

(Electrical & Electronics Engineering)

Time: 3 hours

Max. Marks: 70

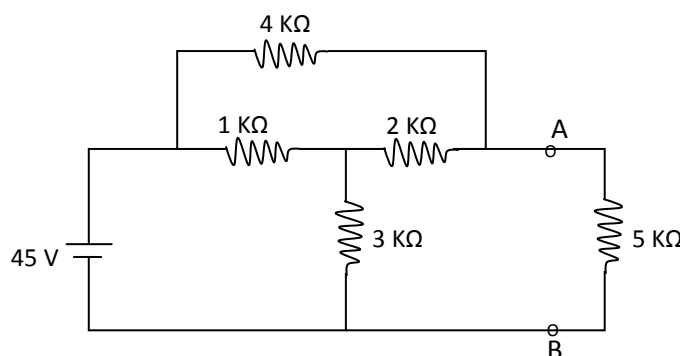
Part – A
(Compulsory Question)

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

- 1 (a) What is passive element? Give examples for passive elements.
- (b) Define and explain coefficient of coupling.
- (c) Define the terms RMS value and form factor.
- (d) If R_a , R_b , R_c connected in star, write down the expressions for equivalent delta connection.
- (e) Define the band width and Q-factor.
- (f) Write short notes on Tieset and cutset.
- (g) State the Milliman's theorem.
- (h) Define and explain two port networks.
- (i) Define the time constant of RL and RC circuits.
- (j) Write down any two applications of Fourier transforms.

Part – B
(Answer all five units, 05 X 10 = 50 Marks)**UNIT - I**

- 2 (a) Derive an expression for total inductance of two coupled coils connected in:
 - (i) series aiding mode and
 - (ii) series opposing mode.
- (b) Find the current through each element in the network as shown in figure given below using star delta transformation.

**OR**

- 3 (a) Explain in detail about the active elements.
- (b) In a coupled circuit $L_2 = 4L_1$ and coupling coefficient $K = 0.6$. When L_1 and L_2 are connected in series opposing the equivalent inductance is 44.2 mH. Find L_1 , L_2 and M .

UNIT - II

- 4 (a) Derive the expression for form factor a sinusoidal voltage wave excited by $V = V_m \sin \omega t$.
- (b) A sinusoidal current wave is given by $I = 50 \sin 100\pi t$. Determine:
 - (i) The greatest rate of change of current.
 - (ii) Average and rms values of current.
 - (iii) The time interval between a maximum value and the next zero value of current.

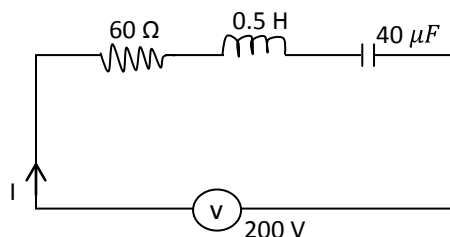
OR

- 5 (a) Show that two wattmeters are sufficient to measure power in a balanced or unbalanced three-phase load connected to a balanced supply with neat circuit diagram.
- (b) A balanced mesh connected load of $(8+j6)\Omega$ per phase is connected to a 3-phase, 50 Hz, 230 V supply. Calculate:
 - (i) Line current.
 - (ii) Power factor.
 - (iii) Reactive volt-ampere.
 - (iv) Total volt-ampere.

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UNIT-III

- 6 (a) What is duality? Write down the procedure to obtain dual network by taking any one example.
 (b) A series RLC circuit shown in figure $R = 60 \text{ ohms}$, $L = 0.5 \text{ H}$ and $C = 40 \mu\text{F}$ is connected across an AC variable frequency supply of 200 V . Calculate the resonant frequency and lower and upper half frequencies.

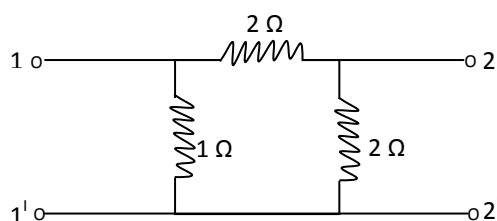


OR

- 7 (a) Define and explain bandwidth, Q-factor, cutset, tieset and tree.
 (b) A coil having an inductance of 50 mH and resistance 10Ω is connected in series with a $25 \mu\text{F}$ capacitor across 200 V AC supply. Calculate:
 (i) Resonant frequency of the circuit.
 (ii) Current flowing at resonance.
 (iii) Quality factor.

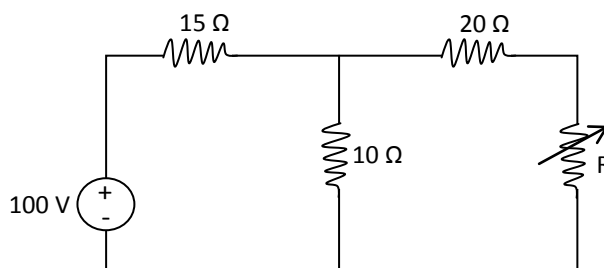
UNIT - IV

- 8 (a) State and explain Thevenin's theorem.
 (b) Find the Z parameters for the resistance network shown in figure given below.



OR

- 9 (a) Derive the expressions for hybrid parameters in terms of admittance parameters.
 (b) In the circuit shown in figure given below, find the value of adjustable resistor R for maximum power transfer to R . Also calculate the maximum power.



UNIT - V

- 10 (a) Derive the expression for exponential form of Fourier series. Mention the application of Fourier transform.
 (b) A series RLC circuit has $R = 50 \Omega$, $L = 0.2 \text{ H}$ and $C = 50 \mu\text{F}$ constant voltage of 100 V is impressed upon the circuit at $t = 0$. Find the expressions for the transient current assuming initially relaxed conditions.

OR

- 11 (a) Explain the properties of Fourier transforms.
 (b) A series RL circuit with $R = 10 \Omega$, $L = 0.2 \text{ H}$ has a constant voltage of a $V = 50 \text{ V}$ applied at $t = 0$. Find the time response of the current.

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