Hall Ticket No | | | | | | | | | | | Question Paper Code: AEEC05

INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)
Dundigal-500043, Hyderabad

B.Tech III SEMESTER END EXAMINATIONS (REGULAR/ SUPPLEMENTARY) - FEBRUARY 2024

Regulation: UG20

NETWORK ANALYSIS

Time: 3 Hours (ELECTRICAL AND ELECTRONICS ENGINEERING) **Max Marks: 70**

Answer ALL questions in Module I and II
Answer ONE out of two questions in Modules III, IV and V
All Questions Carry Equal Marks
All parts of the question must be answered in one place only

MODULE – I

1. (a) Determine the steady-state behavior in a series R-C circuit when exposed to sinusoidal excitation. Develop the essential equations with phasor diagrams. [BL: Understand| CO: 1|Marks: 7]

   (b) A 50 Ω resistor is connected in series with an inductor having internal resistance, a capacitor and 100 V variable frequency supply as shown in Figure 1. At a frequency of 200 Hz, a maximum current of 0.7 A flows through the circuit and voltage across the capacitor is 200 V. Determine the circuit constants. [BL: Apply| CO: 1|Marks: 7]

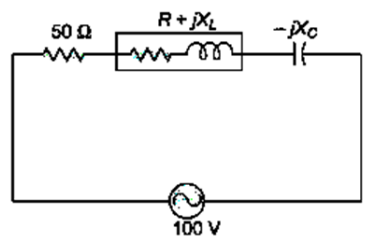

Figure 1

MODULE – II

2. (a) Determine the transient response of a series R-L circuit with DC input. Sketch the variation of current and the voltage across the inductor. [BL: Understand| CO: 2|Marks: 7]

   (b) A series circuit shown in Figure 2 comprising of a resistance of 10 Ω and an inductance of 0.5 H, is connected to a 100 V source at t = 0. Determine the complete expression for the current i(t). [BL: Apply| CO: 2|Marks: 7]

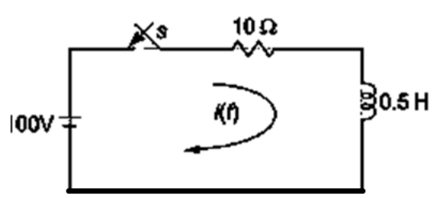

Figure 2

MODULE – III

3. (a) Evaluate the attributes of the locus diagram for an RC circuit where resistance is variable and reactance is fixed. Provide a detailed explanation of how the impedance varies concerning frequency in this specific circuit configuration. [BL: Understand| CO: 3|Marks: 7]

   (b) For the parallel circuit shown in Figure 3, V = 200V; R_2 = 50Ω; X_1= 25 Ω. R_l is varied from 10Ω to 50Ω, draw the locus diagram. Find maximum and minimum values of source current. [BL: Apply| CO: 3|Marks: 7]

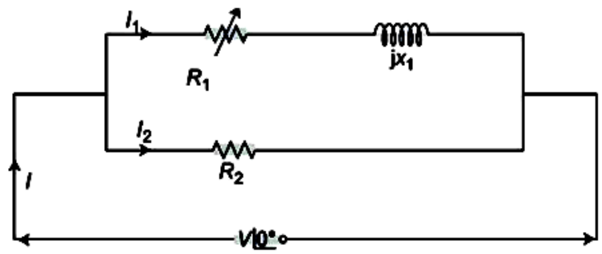

Figure 3

4. (a) What is the substantial impact of poles and zeros on the behavior of network functions, and how do these elements provide insights into the dynamic characteristics of systems? [BL: Understand| CO: 3 |Marks: 7]

   (b) For the network shown in Figure 4, obtain the transfer functions G_{21}(S), Z_{21}(S), and driving-point impedance Z_{11}(S). [BL: Apply| CO: 3|Marks: 7]

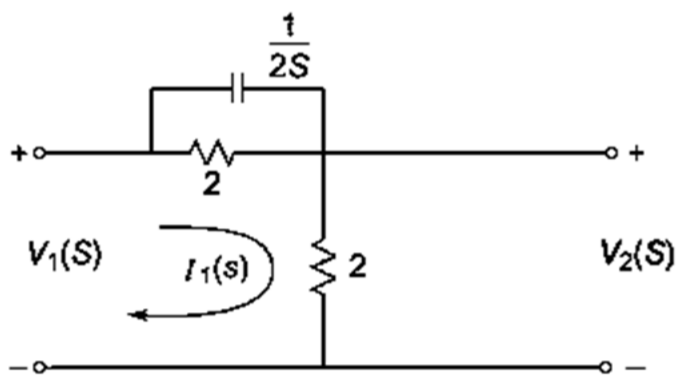

Figure 4

MODULE – IV

5. (a) Describe the arrangement of a three-phase system through star (wye) and delta connections, offering flexibility based on application requirements and electrical characteristics. [BL: Understand| CO: 4|Marks: 7]

   (b) A symmetrical three-phase, three-wire 440 V supply is connected to a star-connected load as shown in Figure 5. The impedances in each branch are Z_R= (2 + j3) Ω, Z_Y = (1 – j2) Ω & Z_B = (3 + j4) Ω. Find its equivalent delta-connected load. The phase sequence is RYB. [BL: Apply| CO: 4|Marks: 7]

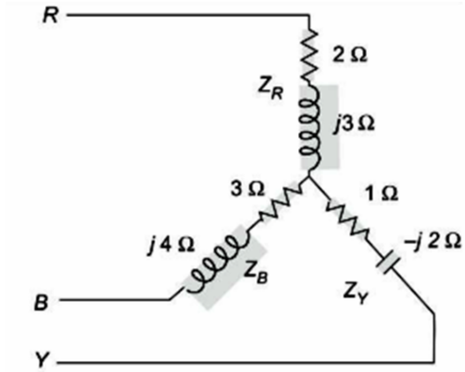

Figure 5

6. (a) Elaborate three-phase unbalanced delta-connected load, accompanied by a clear sketch. Further, derive the relevant equations for current and voltage in this configuration.

   [BL: Understand| CO: 4|Marks: 7]

   (b) The two-wattmeter method is used to measure power in a three-phase load. The wattmeter readings are 400 W and –35 W. Calculate

   i) Total active power

   ii) Power factor

   iii) Reactive power. [BL: Apply| CO: 4|Marks: 7]

MODULE – V

7. (a) Develop the equation for a T-network filter by explaining its components and applying impedance relationships within the network. [BL: Understand| CO: 5|Marks: 7]

   (b) Design a T and π network of a constant-k low-pass filter having cut-off frequency of 1 kHz, design impedance of 400 Ω. [BL: Apply| CO: 5|Marks: 7]

8. (a) Describe the bandpass filter and deduce equations for characteristic impedance, elucidating how this filter allows a specific range of frequencies while maintaining signal quality.

   [BL: Understand| CO: 5|Marks: 7]

   (b) Design a band-elimination filter having a design impedance of 600Ω and cut-off frequencies f_1=2 kHz and f_2 = 6 kHz. [BL: Apply| CO: 5|Marks: 7]

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