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B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2008.

Annual Pattern — First Year

Electronics and Communication Engineering

EC 1 X 02 — CIRCUIT ANALYSIS

(Regulation 2004)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Differentiate between ideal and practical current sources.
2. What is meant by linearity?
3. Distinguish between steady state response and transient response.
4. Prepare a list of dual quantities encountered in electrical engineering.
5. What is the advantage of phasor representation?
6. What is an impedance triangle?
7. How the self inductance is different from mutual inductance?
8. What are transmission parameters?
9. If the Laplace Transform of a function is $\frac{E}{s} e^{-as}$, then determine the function.
10. What is the effect of super imposing a dc component on a complex wave?

PART B — (5 × 16 = 80 marks)

11. (a) (i) Explain the loop current method of solving a network. Differentiate between a loop current and a branch current. When solving a circuit you get a negative sign for a mesh current, then what is the significance of negative sign? How can you find the number of loop equations needed to solve a network? (8)
- (ii) Find the currents through various resistances in the network shown in fig. 11 (a) (ii). (8)

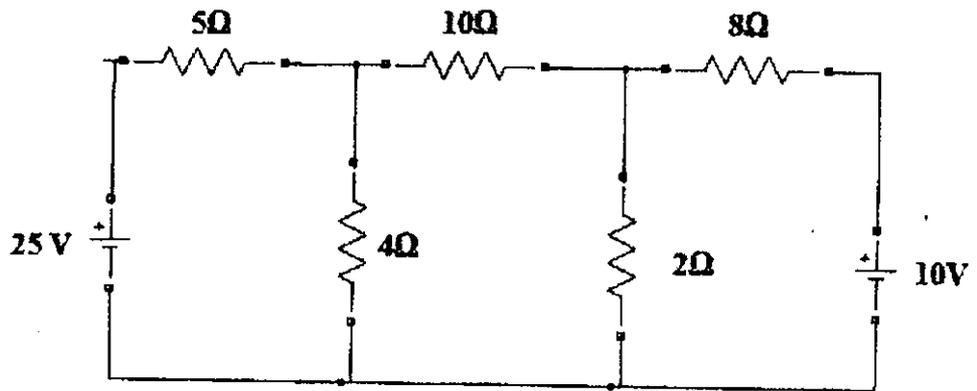


Fig. 11 (a) (ii)

Or

- (b) (i) State the superposition theorem. Explain the method of solving a network by the use of this theorem. Also explain why superposition theorem is applicable for power responses. (6)
- (ii) What is the power loss in the 10 Ω resistor of the fig. 11 (b) (ii)? Use Thevenin's theorem. (10)

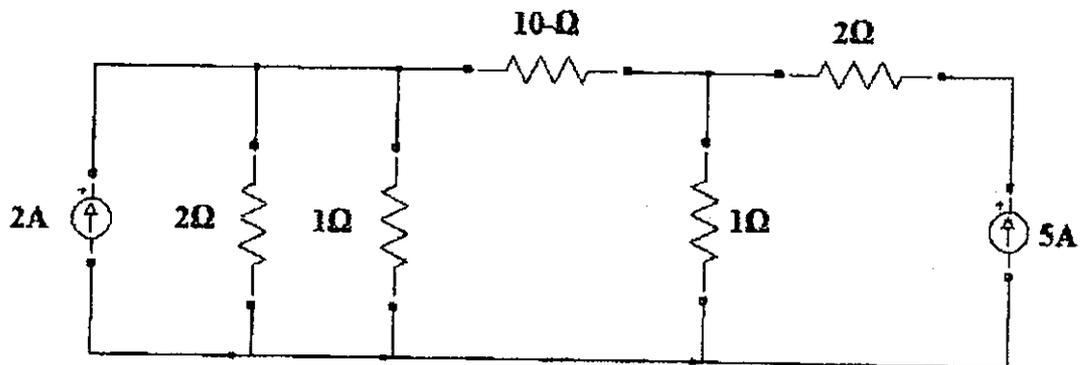


Fig. 11 (b) (ii)

12. (a) (i) Explain why, when an RL circuit is switched on to a dc source, the current does not rise to its final value immediately. (6)
- (ii) In the series RLC circuit shown in the fig. 12 (a) (i), there is no initial charge on the capacitor. If the switch is closed at $t = 0$, determine the resulting current. (10)

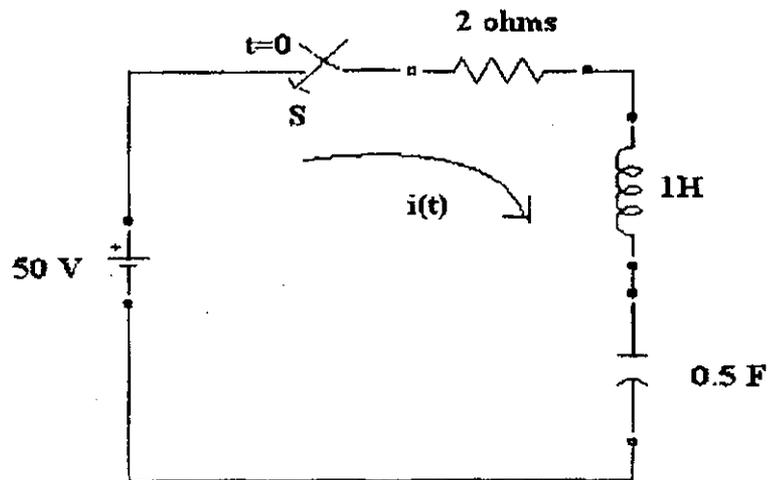


Fig. 12 (a) (i)

Or

- (b) (i) Derive an expression for the energy storage in a inductor. (5)
- (ii) What is time constant? What is significance? (3)
- (iii) Draw the dual network for the network shown in fig. 12 (b) (iii). (8)

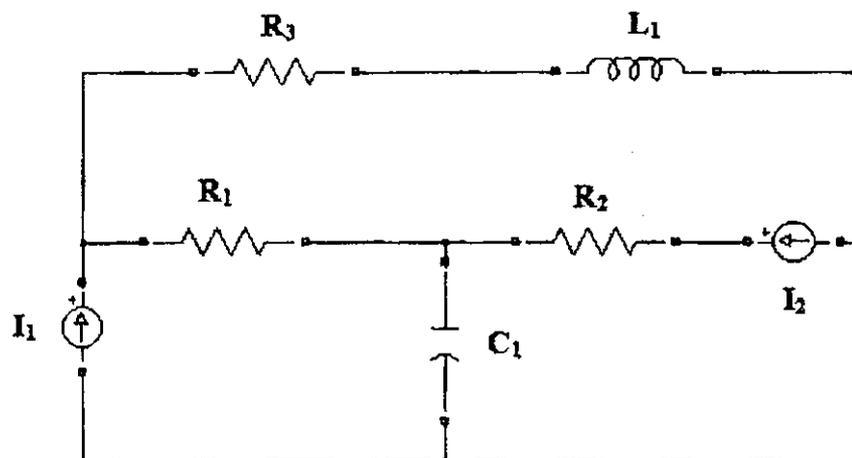


Fig. 12 (b) (iii)

13. (a) (i) Draw the wave shapes for instantaneous voltage, current and power in a series RL circuit. Why is power positive during some intervals and negative in others? What is the effect of these positive and negative power regions in the total power consumed by the circuit? (6)
- (ii) In the network of fig.13 (a) (ii), find the value of V_2 so that the current in the $2 + j3$ ohm impedance is zero. (10)

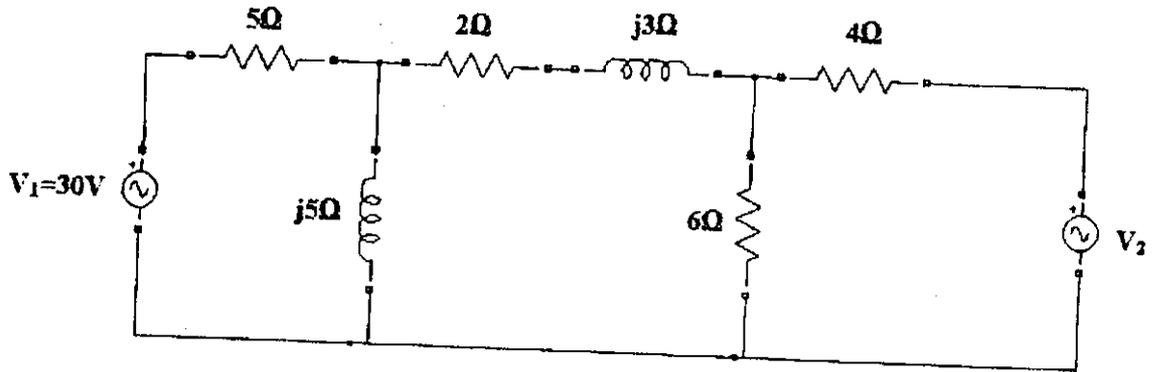


Fig.13 (a) (ii)

Or

- (b) (i) What is power factor? Why is it important quantity in ac circuits? If a circuit has low power factor, what does it indicate? What can be the maximum and minimum value of the power factor? (6)
- (ii) A current of 20 A flows in a circuit when the applied voltage is 200 V. If the current is lagging the voltage by 30° , find resistance, reactance, impedance, admittance, conductance and susceptance. (10)
14. (a) (i) Derive an expression for coefficient of coupling in a magnetically coupled circuit. (6)
- (ii) The coefficient of coupling between two coils is 0.85. Coil I has 250 turns. When the current in coil I is 2 A, the total flux in the coil is 30 mwb. When i_1 is changed from 2 A to zero in 2 m sec, the voltage induced in the coil II is 63.75 V. Find L_1 , L_2 , M and number of turns in the coil II. (10)

Or

(b) (i) A series RLC circuit has $R = 50 \Omega$, $L = 0.01 \text{ H}$ and $C = 0.04 \mu\text{F}$. System voltage is 100 V. Find

(1) resonant frequency

(2) circuit impedance at resonance condition

(3) maximum voltage across capacitor and the frequency at which this occurs. (8)

(ii) The Z parameters of two port network are : $Z_{11} = 2.1 \Omega$, $Z_{12} = Z_{21} = 0.6 \Omega$ and $Z_{22} = 1.6 \Omega$. A resistance of 2Ω is connected across port 2. Find

(1) what voltage must be applied at port 1 to produce a current of 0.5 A in the 2Ω resistance

(2) draw the equivalent circuit of this two port network. (8)

15. (a) (i) Find the final value of the function $f(t) = e^{-t} (\sin 3t + \cos 5t)$. (4)

(ii) For the network shown in fig. 15 (a) (ii), find $Z(s)$ and plot pole zero diagram. (12)

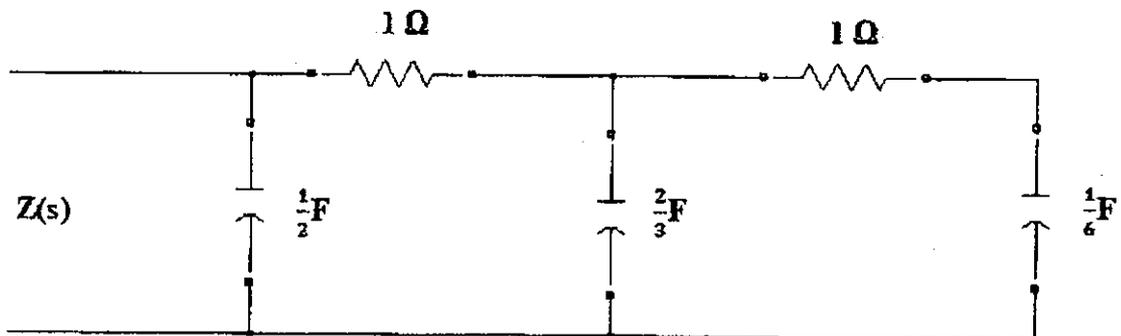


Fig. 15 (a) (ii)

Or

- (b) (i) A voltage wave has value of 100 between 0 and π and zero from π to 2π . Find the first three terms of the Fourier series of the wave. (10)
- (ii) List the main properties of Fourier transform. Bring out the relationship between Fourier transform and Laplace Transform. (6)
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