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Question Paper Code : 51430

B.E./B.Tech. DEGREE EXAMINATION, MAY/JUNE 2014.

Second Semester

Electrical and Electronics Engineering

EE 2151/EE 25/EE 1151/080280005/10133 EE 205 — CIRCUIT THEORY

(Common to Electronics and Instrumentation Engineering and Instrumentation and Control Engineering)

(Regulation 2008/2010)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Determine current in the circuit of Fig. 1.

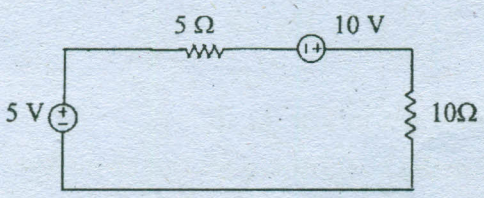

Fig. 1

2. Determine the voltage across 20 ohm resistor of the network shown in Fig. 2.

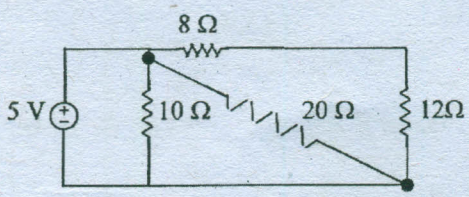

Fig. 2

3. Determine the current through 2 ohm resistor in the circuit of Fig. 3.

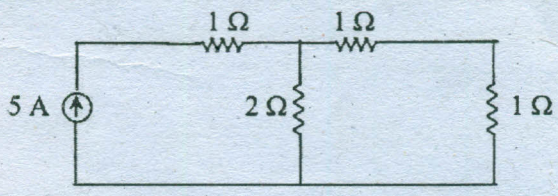

Fig. 3

4. State Maximum power transfer theorem.

5. Draw the frequency response of RLC series circuit.

6. Write the expression which relates the self and mutual inductance.

7. What is free and forced response?

8. What is the time constant of RL circuit with R = 10 ohms and L = 20 mH?

9. Write the relation between the line and phase value of voltage and current in a balanced delta connected system.

10. A star connected balanced load draw a current of 35 A per phase when connected to a 440 V supply. Determine the apparent power.

PART B — (5 × 16 = 80 marks)

11. (a) Determine the currents through the resistances in the bridge network shown in Fig. 11 (a) using Kirchoff's laws. (16)

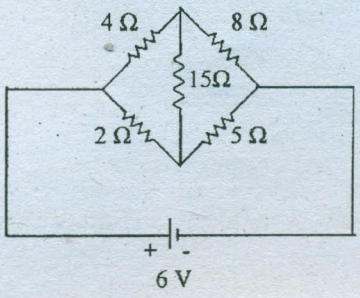

Fig. 11 (a)

Or

(b) For the circuit shown in Fig. 11 (b),

(i) Determine the currents in all the branches (10)

(ii) Calculate the power and power factor of the source (4)

(iii) Show that power delivered by the source is equal to power consumed by 2 ohm resistor. (2)

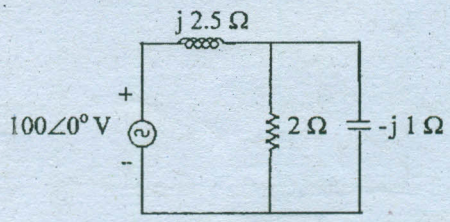

Fig. 11 (b)

12. (a) (i) For the circuit shown in Fig. 12 (a) (i), using Thevenin's theorem, find the current in the 10 ohm resistor. (12)

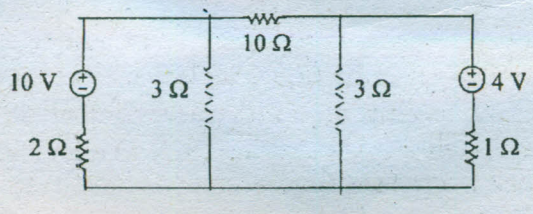

Fig. 12 (a) (i)

(ii) Determine the current through 20 V source in the circuit of Fig. 12 (a) (ii). (4)

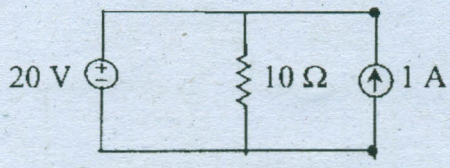

Fig. 12 (a) (ii)

Or

(b) (i) Calculate the current in the 4 Ω resistor of Fig. 12 (b) (i) using superposition theorem. (8)

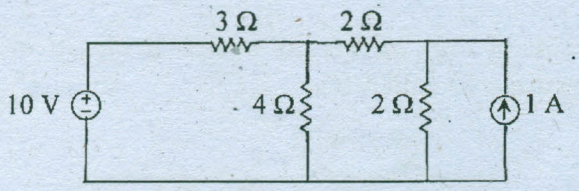

Fig. 12 (b) (i)

(ii) In the circuit of Fig. 12 (b) (ii), find the value of R for maximum power transfer. Also, calculate the maximum power. (8)

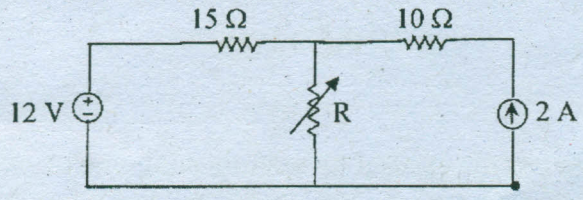

Fig. 12 (b) (ii)

13. (a) (i) A RLC series circuit consists of R = 16 Ω, L = 5 mH and C = 2 μF. Calculate the quality factor at resonance, bandwidth and half-power frequencies. (8)

(ii) Determine the value of R_L for resonance in the network shown in Fig. 13 (a) (ii). (8)

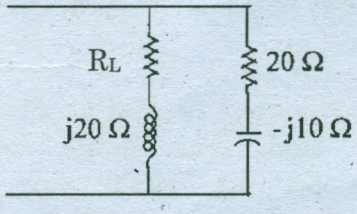

Fig. 13 (a) (ii)

Or

(b) (i) A coil having an inductance of 100 mH is magnetically coupled to another coil having an inductance of 900 mH. The coefficient of coupling between the coils is 0.45. Calculate the equivalent inductance if the two coils are connected in (1) series opposing and (2) parallel opposing. (4)

(ii) For the circuit shown in Fig. 13 (b), determine the voltage ratio V_1 / V_2, which will make the current I_1 equal to zero. (12)

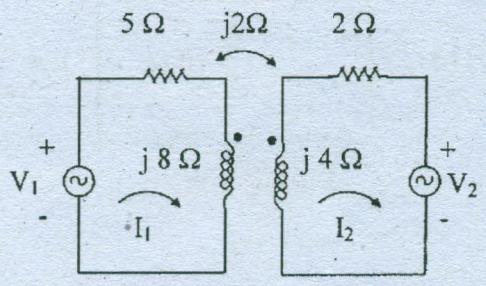

Fig. 13 (b)

14. (a) In the circuit of Fig. 14 (a), the switch is closed at $t = 0$. Determine the mesh currents $i_1(t)$ and $i_2(t)$. (16)

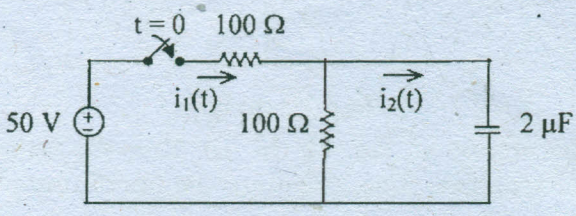

Fig. 14 (a)

Or

(b) A RL series circuit excited by a sinusoidal source $e(t) = 10 \sin 100t$ volts, by closing the switch at $t = 0$. Take $R = 10\ \Omega$ and $L = 0.1$ H. Determine the current $i(t)$ flowing through the RL circuit. (16)

15. (a) A symmetrical 3-phase, 100 V, 3-wire supply feeds an unbalanced star connected load with impedances of the load as $Z_R = 5\angle 0^\circ\ \Omega$, $Z_Y = 2\angle 90^\circ\ \Omega$ and $Z_B = 4\angle -90^\circ\ \Omega$. Find the line currents, voltage across the impedances and draw the phasor diagram. Also calculate the power consumed by the load. (16)

Or

(b) The two wattmeter method is used to measure power in a three-phase delta connected load. The delta connected load consists of $Z_{RY} = 10 + j10\ \Omega$, $Z_{YB} = 15 - j15\ \Omega$ and $Z_{BR} = 20 + j10\ \Omega$ and it is connected to a 400 V, three-phase supply of phase sequence RYB. Calculate the readings of wattmeter with current coil in line R and B. (16)
