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Question Paper Code : 80365

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2016.

Second Semester

Electronics and Communication Engineering

EE 6201 — CIRCUIT THEORY

(Common to Electrical and Electronics Engineering, Electronics and Instrumentation Engineering, Instrumentation and Control Engineering, Biomedical Engineering and Medical Electronics Engineering)

(Regulations 2013)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What are the limitations of Ohm's law?

2. The equivalent resistance of four resistors joined in parallel is 30 ohms. The current flowing through them are 0.5,0.4,0.6 and 0.1A. Find the value of each resistor.

3. Determine the value of current I_0 of the given figure. 3

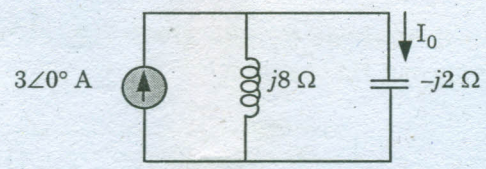

Fig. 3

4. State reciprocity theorem.

5. Draw the frequency response characteristics of parallel resonant circuit.

6. Determine the equivalent inductance of the circuit comprising two inductors in series opposing mode.

7. Determine the Laplace transform of unit step function u(t) and sinusoidal function sin(ωt).

8. A RLC series circuit has R = 10 ohms and L = 2H. What value of capacitance will make the circuit critically damped?

9. What is a phase sequence of 3 phase system?

10. List any two advantages of three phase system over single-phase system.

PART B — (5 × 16 = 80 marks)

11. (a) (i) Calculate the node voltages of given circuit in fig. 11(a) (i). (8)

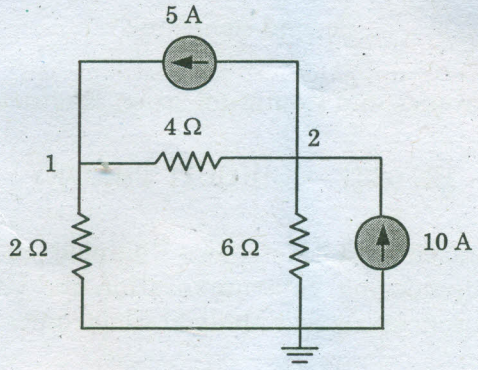

Fig. 11 (a) (i)

(ii) Determine current I_0 for the given circuit in Fig. 11(a) (ii) when $v_s = 12$ V. (8)

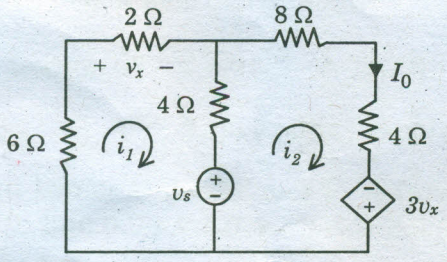

Fig. 11 (a) (ii)

Or

(b) (i) Using mesh analysis for the given fig. 11(b) (i), find the current I_2 and drop across 1Ω resistor. (12)

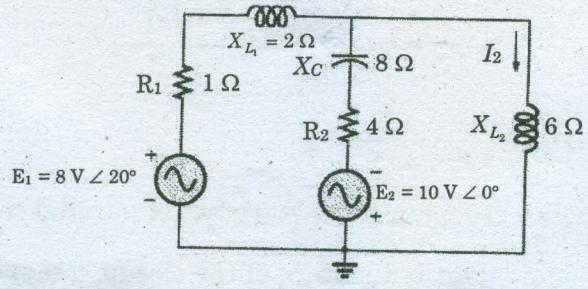

Fig. 11 (b) (i)

(ii) Find the equivalent capacitance C between terminals A and B of fig. 11(b) (ii). (4)

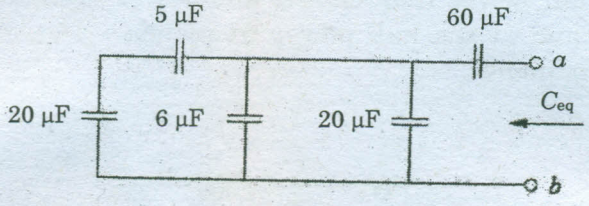

Fig. 11 (b) (ii)

12. (a) (i) Obtain the equivalent resistance R_{ab} of the circuit given in Fig. 12 (a) (i) and calculate the total current i. (8)

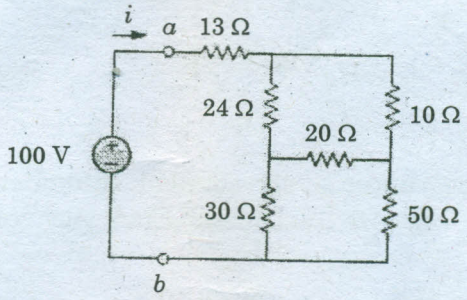

Figure 12 (a) (i)

(ii) Find the value of R_L in fig. 12 (a) (ii) for maximum power to R_L and calculate the maximum power. (8)

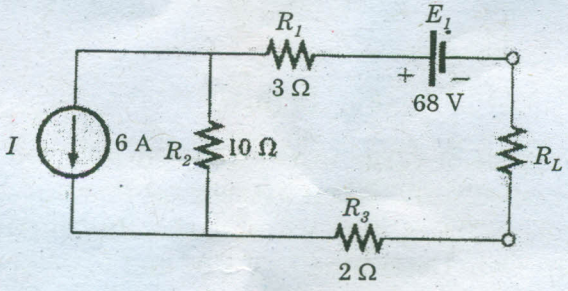

Figure 12 (a) (ii)

Or

(b) Apply superposition theorem to determine current i through 3Ω resistor for the given circuit in fig. 12(b). (16)

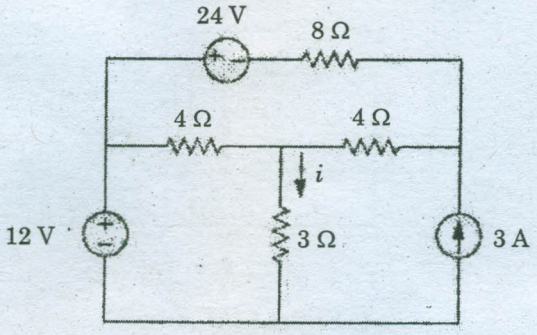

Figure 12 (b)

13. (a) For the series resonant circuit of Fig. 13 (a), find I, V_R, V_L, and V_C at resonance. Also, if resonant frequency is 5000Hz, determine bandwidth, Q factor, half power frequencies, and power dissipated in the circuit at resonance and at the half power frequencies. Derive the expression for resonant frequency. (16)

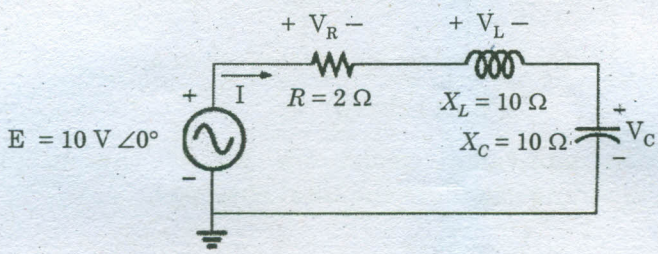

Fig. 13 (a)

Or

(b) (i) Obtain the conductively coupled equivalent circuit for the given circuit in Fig. 13 (b) (i) and Find the voltage drop across 12 Ω resistor. (8)

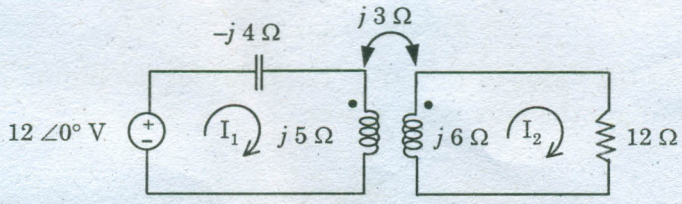

Fig. 13 (b) (i)

(ii) The number of turns in two coupled coils are 500 turns and 1500 turns respectively. When 5 A current flows in coil 1, the total flux in this coil is 0.6×10^{-3} wb and the flux linking in second coil is 0.3×10^{-3} wb. Determine L_1, L_2, M and K. (8)

14. (a) A series R_L circuit with R = 50 Ω and L = 30 H has a constant voltage V = 50 volts applied at t = 0 as shown in fig. 14 (a). Determine the current i, voltage across inductor. Derive the necessary expression and plot the respective curves. (16)

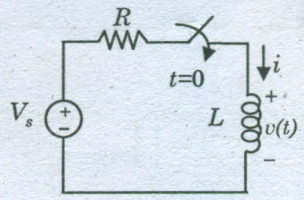

Fig. 14 (a)

Or

(b) (i) Determine the impedance (Z) parameter of the given two port network in Fig. 14(b) (i). (8)

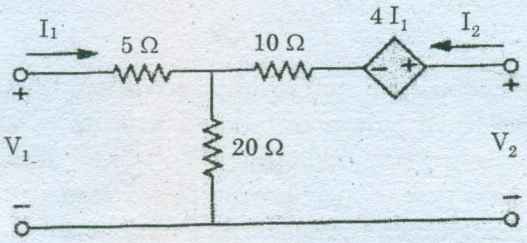

Fig. 14 (b) (i)

(ii) Find the hybrid (h) parameter of the two port network in Fig. 14 (b)(ii). (8)

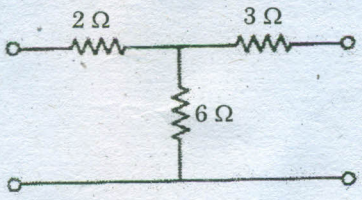

Fig. 14 (b) (ii)

15. (a) (i) For the Δ-Δ system shown in fig. 15 (a) (i), find the phase angles θ_2 and θ_3 for the specified phase sequence. Also, find the phase current and line current in each phase of the load. (8)

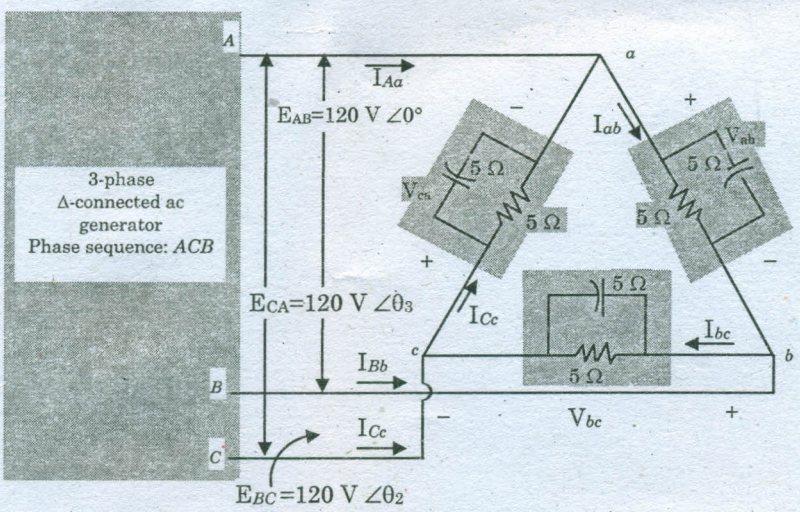

Fig. 15 (a) (i)

(ii) A 3 phase 400V supply is given to balanced star connected load of impedance (8 + 6j) ohms in each branch. Determine line current, power factor and total power. (8)

Or

(b) The two wattmeter produces wattmeter readings P_1 = 1560W and P_2 = 2100W when connected to a delta connected load. If the line voltage is 220V, calculate (i) the per phase average power (ii) total reactive power, (iii) power factor and (iv) the phase impedance. Is the impedance inductive or Capacitive? Justify. (16)