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M 010 MODEL PAPER

B.E. DEGREE EXAMINATION.

Second Semester

Electronics and Communication Engineering

EC 142 — CIRCUIT THEORY

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What are the differences between loop analysis and nodal analysis?

2. Which statement is correct?

   When two resistors R_1 & R_2 $(R_1 < R_2)$ are in parallel the resultant R is

   (a) Sum of R_1 and R_2 (b) Less than R_1

   (c) Between R_1 and R_2 (d) Greater than R_2.

3. State superposition theorem.

4. State reciprocity theorem.

5. Define quality factor.

6. What is meant by resonance? What is its significance?

7. What is the time–constant of R–L circuit? What does it represent for?

8. What is meant by transient response and steady state response?

9. Define trees and chords.

10. Define duality. What is the dual of capacitance and resistance?

PART B — (5 × 16 = 80 marks)

11. Find the current I flowing through 10 Ω resistor shown in Figure 11.

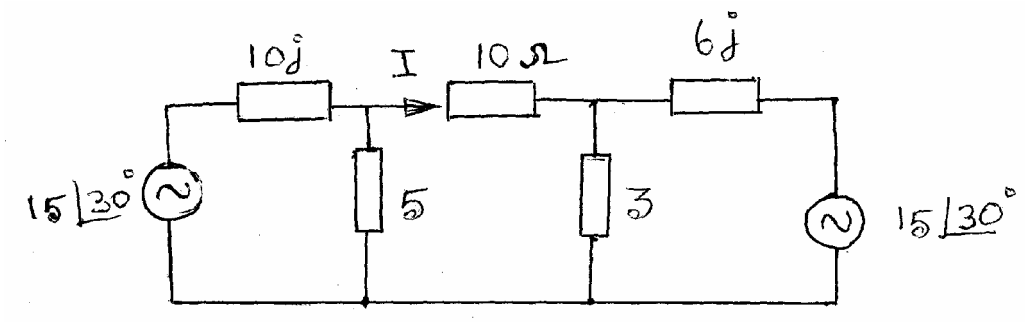


Figure 11

12. (a) Find the equivalent resistance of the circuit shown in Figure 12 (a).

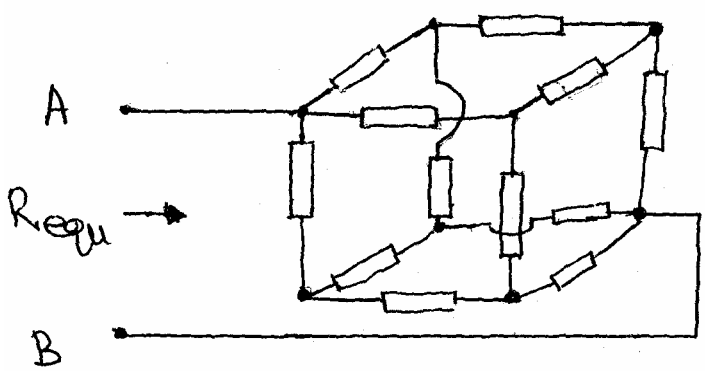


Figure 12 (a)

All resistances are equal to R Ω.

Or

(b) Find the maximum power across the resistance Z_L shown in Figure 12 (b). What is the corresponding value of Z_L ?

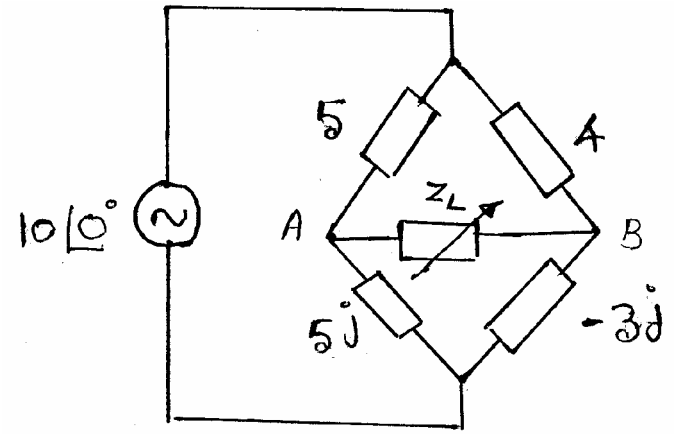


Figure 12 (b)

13. (a) (i) Derive an expression to find the resonant frequency of the circuit shown in Figure 13 (a). (8)

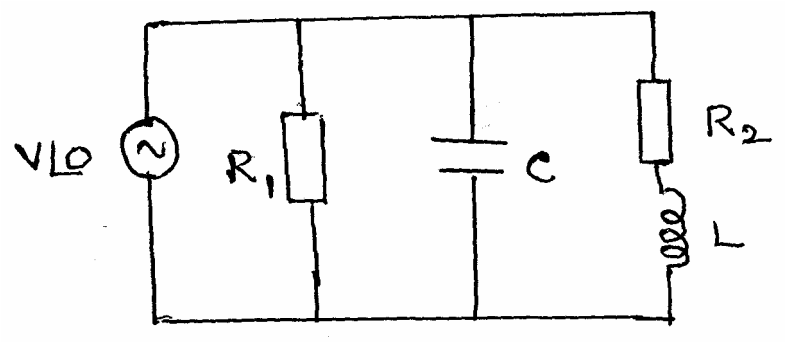


Figure 13 (a)

(ii) Derive the relationship among, quality factor, resonant frequency and bandwidth for a series RLC circuit. (8)

Or

(b) (i) Define co–efficient of coupling. (2)

(ii) Derive the voltage amplification factor for single tuned coupled circuit as shown in Figure 13 (b). (14)

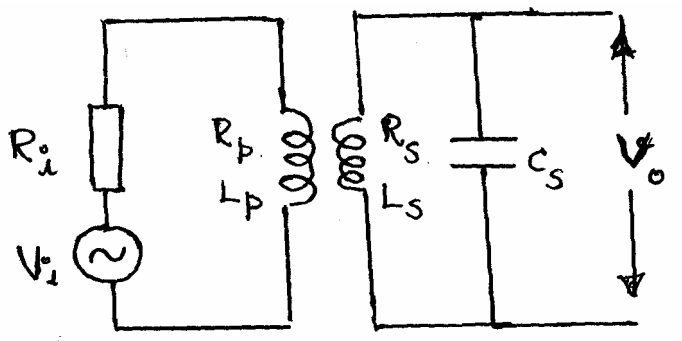
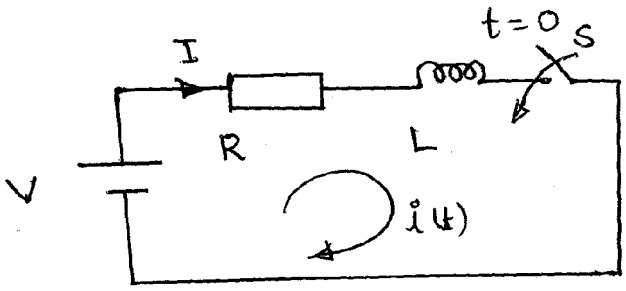


Figure 13 (b)

14. (a) Find the time taken to reach 63.3% of the steady state current value of the circuit shown in Figure 14 (a). Plot $i(t)$ and voltage across L.



Switch S

Closes at $t = 0$

Figure 14 (a)

Or

(b) Find the expression for the current $i(t)$ in the circuit shown in Figure 14 (b) and plot $i(t)$.

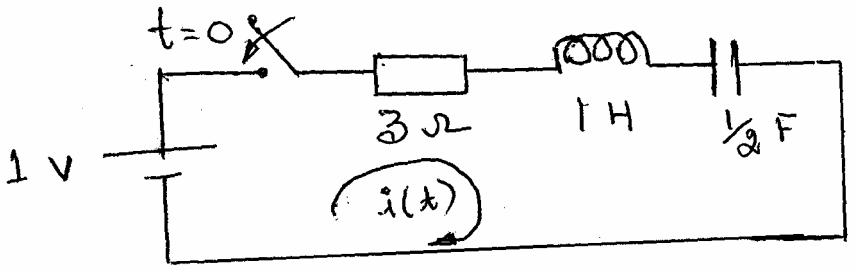
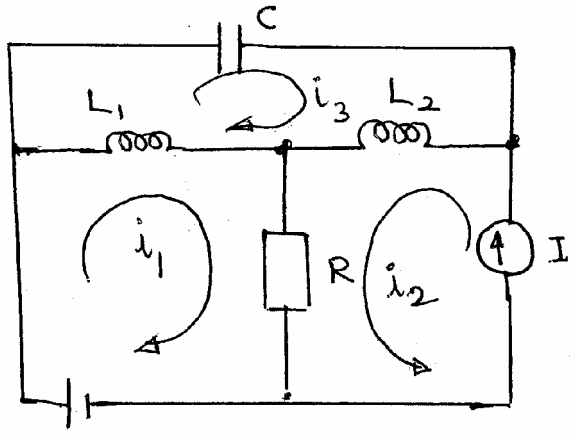


Figure 14 (b)

15. (a) Write down the loop equation for the circuit shown in Figure 15 (a). Obtain the dual of this network and its corresponding nodal equations.



Current source = I

Voltage source = V

Figure 15 (a)

Or

(b) Draw the possible trees of the given graph shown in Figure 15 (b). Write down the cut–set matrix and the set of current and voltage equations for the tree with 4, 8, 6 and 2 as branches.

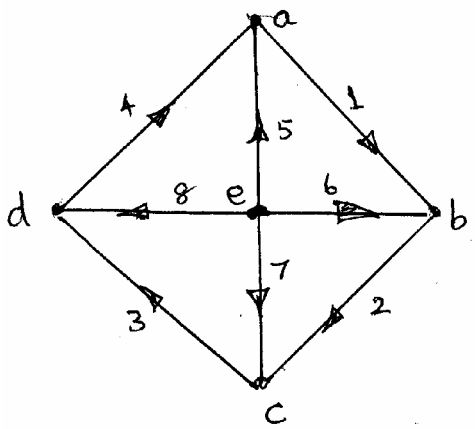


Figure 15 (b)