Reg. No. : | | | | | | | | | | | | |

Question Paper Code : 20458

B.E./B.Tech. DEGREE EXAMINATIONS, APRIL/MAY 2022.

Second Semester

Electronics and communication Engineering

EC 8251 — CIRCUIT ANALYSIS

(Common to Biomedical Engineering/Electronics and Telecommunication Engineering/Medical Electronics

(Regulations 2017)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. State Kirchhoff's Laws.

2. Draw the incidence matrix of the following graph shown in Figure 2.

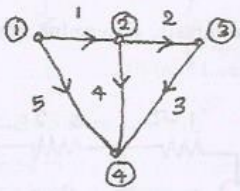

Figure 2

3. State Reciprocity theorem.

4. Find the value of load resistance shown in Figure 4 to receive maximum power.

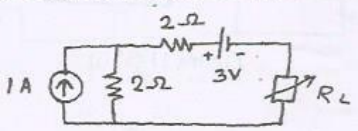

Figure 4

5. State dot rule.

6. Determine the resonance frequency of a series RLC circuit having R = 2 Ω, L = 10 mH and C = 0.025 μF.

7. Write the expression for damping ratio of RLC series circuit.

8. A DC voltage of 100V is applied to a coil having R = 10 Ω and L = 10 H. Write the expression for the current passing through the coil.

9. Define hybrid parameters of a two port network.

10. Find the Z parameters of the network shown in Figure 10.

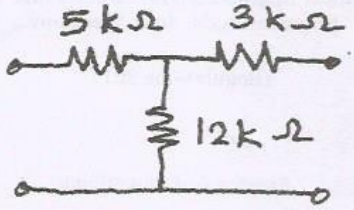

Figure 10

PART B — (5 × 13 = 65 marks)

11. (a) (i) Using nodal analysis, determine the current through 2V source shown in Figure 11 (a) (i). (7)

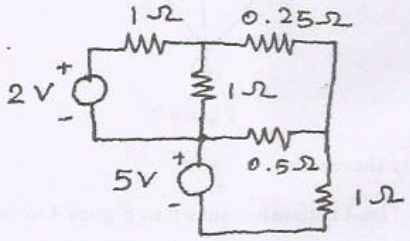

Figure 11 (a) (i)

(ii) By applying mesh analysis, determine the current through 10 V source shown in Figure 11 (a) (ii). (6)

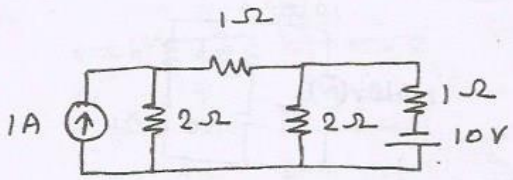

Figure 11 (a) (ii).

Or

(b) Calculate the loop currents of the circuit shown in Figure 11 (b) using tie set matrix. (13)

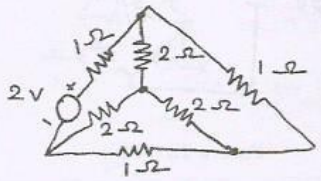

Figure 11 (b)

12. (a) (i) Find the current through 10 Ω resistor in the circuit shown in Figure 12 (a) (i) using Thevenin's theorem. (7)

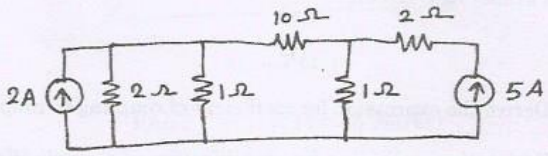

Figure 12 (a) (i)

(ii) Find the current in the 1 Ω resistor for the circuit shown in Figure 12 (a) (ii) using Norton's Theorem. (6)

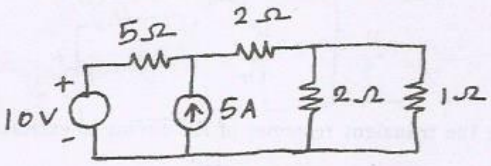

Figure 12 (a) (ii)

Or

(b) (i) In the network shown in Figure 12 (b) (i) find X_L. (7)

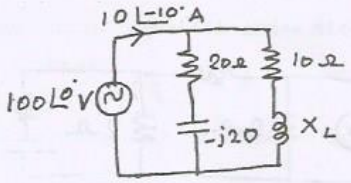

Figure 12 (b) (i)

(ii) Find the source current in Figure 12 (b) (ii). (6)

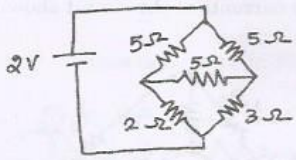

Figure 12 (b) (ii)

13. (a) Derive the expression for resonant frequency in

(i) Series RLC circuit. (5)

(ii) Parallel RLC circuit. (8)

Or

(b) (i) Derive the expression for coefficient of coupling in coupled circuit. (5)

(ii) Derive the expression for amplification of a single tuned circuit at resonance and its optimum value. (8)

14. (a) Explain the transient response of RL and RC circuit to excitation by step signal. (13)

Or

(b) Explain the transient response of RL circuit to excitation by sinusoidal signal. (13)

15. (a) (i) Obtain the transmission parameters of the network shown in Figure 15 (a) (i). (9)

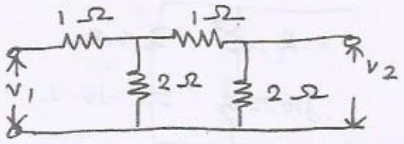

Figure 15 (a) (i)

(ii) Following short circuit currents and voltages are obtained experimentally for a two port network

(1) With output short-circuited, $I_1 = 5$ mA: $I_2 = -0.3$ mA; $V_1 = 25$ V.

(2) With input short-circuited, $I_1 = -5$ mA; $I_2 = 10$ mA; $V_2 = 30$ V.

Determine Y parameters. (4)

Or

(b) In the network shown in Figure 15 (b) find (i) Z parameters and (ii) Y parameters. (13)

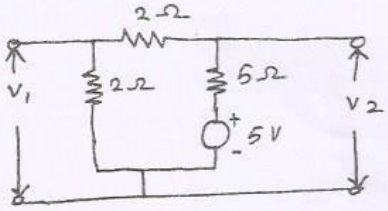

Figure 15 (b)

PART C — (1 × 15 = 15 marks)

16. (a) Obtain Thevenin's equivalent circuit at the terminals x-y of the circuit shown in Figure 16 (a). (15)

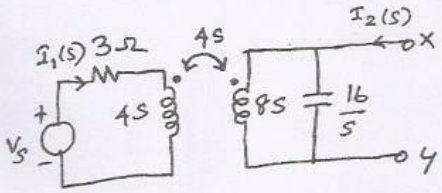

Figure 16 (a)

Or

(b) (i) Show that no value of R_L in the circuit shown in Figure 16 (b) (i) will make it resonant. (9)

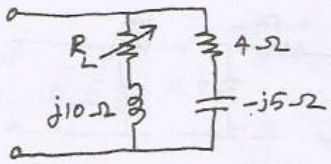

Figure 14 (b) (i)

(ii) Design the values of R, L and C in a series RLC circuit that resonates at 1.5 kHz and consumes 50 W from a 50V AC source operating at resonance frequency. The bandwidth is 750 Hz. (6)
