SRK/KW/14/6934/6939

Faculty of Engineering & Technology
Third Semester B.E. (Electronic/ET/EC) (C.B.S.)
Examination
NETWORK ANALYSIS AND SYNTHESIS

Time—Three Hours] [Maximum Marks—80

INSTRUCTIONS TO CANDIDATES

(1) All questions carry marks as indicated.

(2) Due credit will be given to neatness and adequate dimensions.

(3) Assume suitable data wherever necessary.

(4) Illustrate your answers wherever necessary with the help of neat sketches.

(5) Use of Slide rule, Logarithmic tables and non-programmable calculator is permitted.

1. (a) For the network shown in Fig. 1(a), find the current through 100 Ω resistance due to d.c. sources. Also

find the current through inductor under steady-state. 5

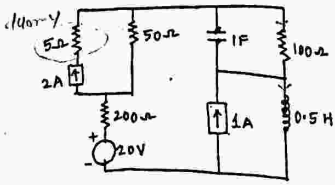

Fig. 1(a)

(b) Write the mesh basis equilibrium equations in matrix form for the network shown in Fig. 1(b). 8

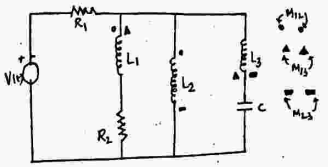

Fig. 1(b)

OR

2. (a) Explain the term duality. Find the dual of the network shown in Fig. 2(a). 6

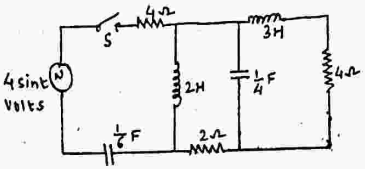

Fig. 2(a)

(b) Determine the node voltages V_A and V_B and find out power dissipated in the resistance of 3Ω in the circuit shown in Fig. 2(b) using nodal analysis. 7

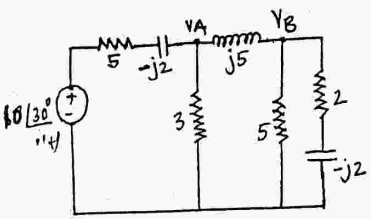

Fig. 2(b)

3. (a) Determine voltage $\overline{V}$ of Fig. 3(a) such that the current through the impedance (3 + j4) Ω is zero. Use Thevenin's theorem. 7

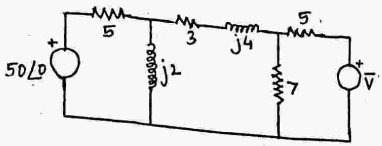

Fig. 3(a)

(b) In the network shown in Fig. 3(b) find 'I' and verify reciprocity theorem. 7

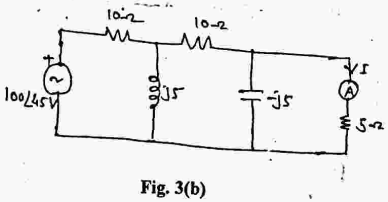

Fig. 3(b)

OR

4. (a) Find the impedance to be connected across terminals A and B of Fig. 4(a) for maximum power transfer. Find also the value of P_{max}. 7

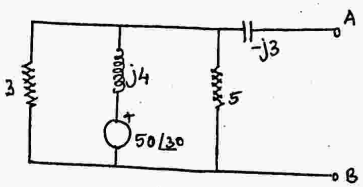

Fig. 4(a)

(b) State the Superposition theorem. Find current through 5Ω resistance by superposition theorem shown in Fig. 4(b). 7

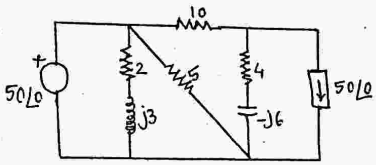

Fig. 4(b)

5. (a) Explain resonance in series R-L-C circuit in detail. Also derive the expression for resonant frequency. 6

(b) A series R-L-C circuit consists of R = 1000 Ω, L = 100 mH and C = 10 μF. The applied voltage across the circuit is 100 V :

(i) Find the resonant frequency of the circuit.

(ii) Find the quality factor of the circuit at resonant frequency.

(iii) Calculate half power frequencies.

(iv) Calculate the bandwidth of the circuit. 7

OR

6. (a) Derive an expression for resonant frequency of the parallel circuit shown in Figure 6(a). 6

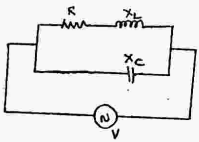

Fig. 6(a)

(b) A coil of resistance 20 Ω and inductance 200 μH is in parallel with a variable capacitor. The voltage of the supply is 200 V at a frequency of 10^6 Hz. Calculate :

(i) The value of capacitor to give resonance.

(ii) The Q factor of the coil.

(iii) The current in each branch of the circuit at resonance. 7

7. (a) Design a prototype band pass filter section having cut-off frequencies of 2000 Hz and 5000 Hz with nominal characteristic impedance of 600 Ω. 6

(b) Design m-derived low pass filter terminated by 600 Ω resistance and cut-off frequency of 1000 Hz and frequency of infinite attenuation of 1250 Hz. Show both T and π-sections. 7

OR

8. (a) Explain the design of T type attenuator. 6

(b) Design a balanced and symmetrical π type attenuator to give 15 decibal loss. The characteristic impedance

of the attenuator is 600 Ω. Draw the network designed and derive the equations used. 7

9. (a) Write the equation for following voltage waveform and find its Laplace transform. Refer Fig. 9(a). 6

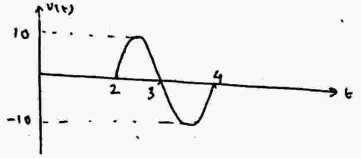

Fig. 9(a)

(b) Find current i(t) in the Fig. 9(b) if the switch is in position 'A' till steady state is reached and is shifted to 'B' at t = 0. Use Laplace transform. 7

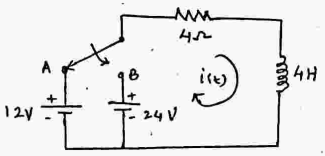

Fig. 9(b)

OR

10. (a) In the network shown in Fig. 10(a) switch K is in position 'a' for a long time. At time t = 0, K is moved to position 'b'. Find voltage $V_2(t)$ for t > 0. 6

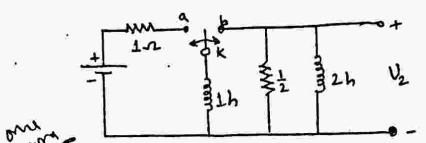

Fig. 10(a)

(b) In the Fig. 10(b) the switch K is moved from position 'a' to 'b' at t = 0 having been in position 'a' for a long time before t = 0. Find the particular solution for (i) i(t), t ≥ 0 (ii) $U_2(t)$, t ≥ 0. 7

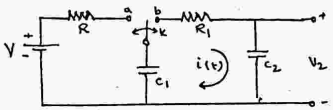

Fig. 10(b)

11. (a) Derive the condition for reciprocity in terms of ABCD parameters for the two port network. 7

(b) Obtain z-parameters of a two port network shown in Fig. 11(b). 7

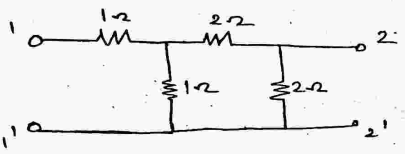

Fig. 11(b)

OR

12. (a) Find the voltage transfer ratio $G_{12}(s)$ for the network shown in Fig. 12(a). 7

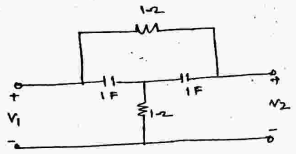

Fig. 12(a)

(b) For the ladder network shown in Fig. 12(b). find $Z_{11}(s)$ and $G_{12}(s)$. 7

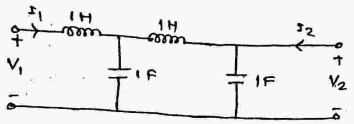

Fig. 12(b)