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Total Page No. : 4

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B.TECH. III SEM MAIN/BACK (NEW SCHEME)
ACADEMIC SESSION 2023-24
ELECTRONICS AND COMMUNICATION ENGINEERING

3EC4–03 - Network Theory

Time : 3 Hours] [**Max. Marks** : 70

[Min. Passing Marks :

Instructions to Candidates :

Part–A : Short Answer Type Questions (up to **25** words) 10 × 2 = 20 marks. All 10 questions are compulsory.

Part–B : Analytical/Problem Solving questions 5 × 4 = 20 marks. Candidates have to answer 5 questions out of 7.

Part–C : Descriptive/Analytical/Problem Solving questions 3 × 10 marks = 30 marks. Candidates have to answer 3 questions out of 5.

Schematic diagrams must be shown wherever necessary. Any data you feel missing may suitably be assumed and stated clearly. Units of quantities used/ calculated must be stated clearly.

Use of the following supporting materials is permitted during examination. (Mentioned in form no. 205).

1__NIL_____ 2__NIL_____

Part-A

10×2=20

Q. 1. Define the concept of duality and dual networks. [2]

Q. 2. What is the major difference between the Mesh and Loop ? [2]

Q. 3. State and explain maximum power transfer theorem. [2]

Q. 4. Explain initial and final condition in network elements. [2]

Q. 5. What do you mean by steady state and transient state response ? [2]

Q. 6. Write down the definition of Laplace Transform. Find the Laplace Transform of te^{-2t}. [2]

Q. 7. What are the relations in transmission parameters of a two-port network ? [2]

Q. 8. Write the condition of symmetry and reciprocal for hybrid parameters. [2]

Q. 9. Write a short note on a series RLC circuit resonance. [2]

Q. 10. Write and explain the separation properties for reactive networks. [2]

Part-B

5×4=20

Q. 1. Apply superposition theorem to the given circuit (figure 1), to find the voltage drop V across the 5 ohm resistor.

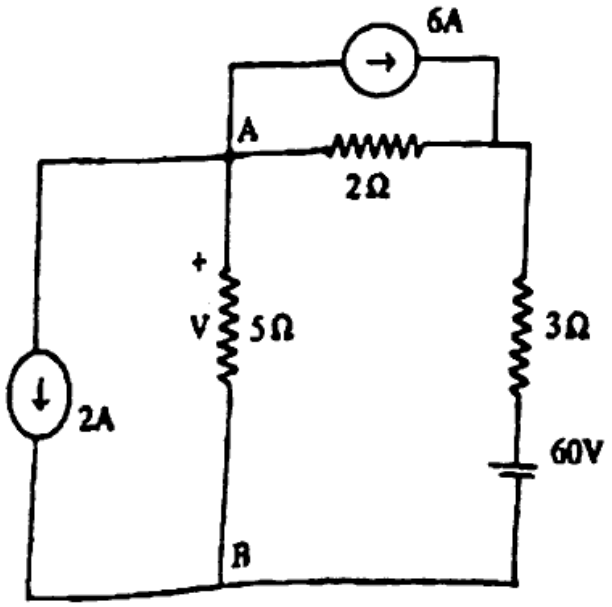

Fig. 1

Q. 2. State and explain Reciprocity theorem. Also write the steps for solving a network using Reciprocity theorem. [4]

Q. 3. Find the steady state and transient response of a series R-L circuit supplied by unit impulse input. [4]

Q. 4. In figure 2, switch is closed at position A at $t = 0$ the switch is moved to position B. Find the currents in both the cases. [4]

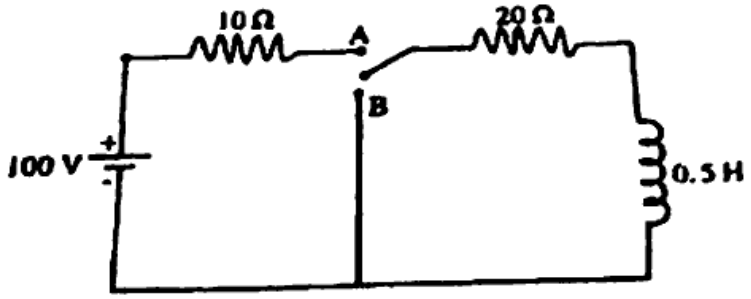

Fig. 2

Q. 5. Calculate the hybrid parameters of the two-port network shown in figure 3. [4]

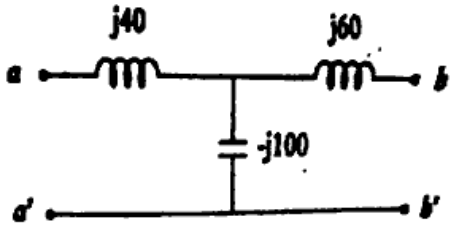

Fig. 3

Q. 6. The Z-parameters of a two port network are Z_{11} = 10 ohms, Z_{22} = 20 ohms, $Z_{12} = Z_{21}$ = 5 ohms.

(a) Find ABCD parameters and also

(b) Find hybrid parameters of this two port network. [4]

Q. 7. Find the Foster first and second form of the below given impedance function : [4]

$$Z(s)=\frac{5(s+1)(s+3)}{s(s+2)}$$

Part-C

3×10=30

Q. 1. State the Thevenin's theorem. Obtain the current in 5 Ω resistor connected between terminals x and y by Thevenin's theorem in the circuit shown in the Figure 4. [10]

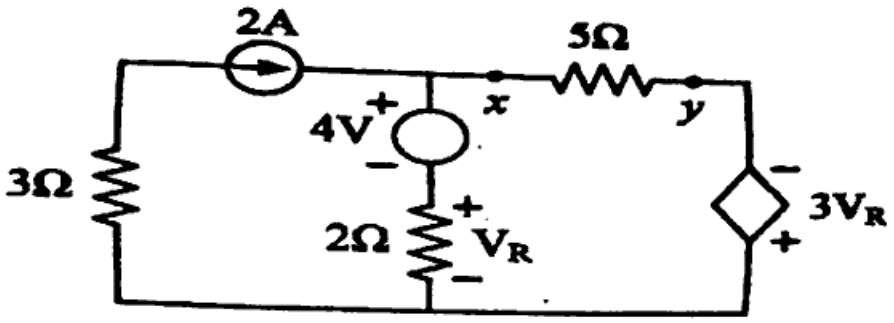

Fig. 4

Q. 2. Find the transient responses of series RL and RC circuit having sinusoidal excitation. [10]

Q. 3. Find the Laplace transform of the function $x(t) = \mu(t) - \mu(t - \theta)$. Also a function is given by $X(S)=\frac{2(s+2)}{(s+1)(s+3)}$. Find its value using the initial value theorem and the final value theorem. [10]

Q. 4. Explain and establish all different types of interconnections of 2 two port networks. [10]

Q. 5. (a) Write and explain the properties of Positive real function.

(b) Find the Cauer first and second form of the below given impedance function :

$$Z(s)=\frac{5(s+2)(s+4)}{(s+1)(s+3)}$$

[5+5=10]

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