Total number of printed pages:3

D/3rd/DECE305

2021

ELECTRIC CIRCUITS AND NETWORK

Full Marks: 100

Time: Three hours

The figures in the margin indicate full marks for the questions.

Answer any five questions.

5 X 20 =100

1. 6+(3+3)+ (3+5)

(a) Prove that the energy stored in a capacitor of capacitance C is $\frac{1}{2}CV^2$ where V is the voltage across the capacitor.

(b) State and explain Kirchhoff's current and voltage laws

(c) What are the different types of network analysis? Describe the factors on which the choice of analysis method depends.

2. 6+6+8

(a) Prove that if two resistance R_1 and R_2 are connected in parallel then value of equivalent resistance R_{ab} is $R_{ab} = \frac{R_1 R_2}{R_1 + R_2}$

(b) Find the equivalent resistance R_{ab} of the of the circuit given in Figure-1 given below

(c) Convert the delta network to its equivalent wye network of Figure-2 given below

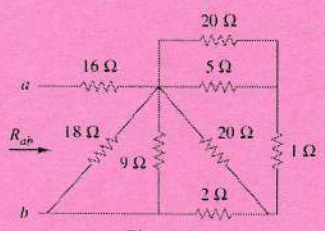

Figure-1

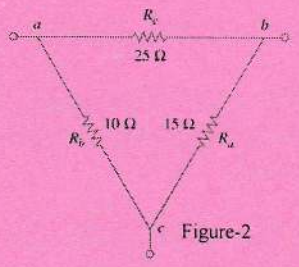

Figure-2

3. (3+5) +6 + (3+3)

(a) State and prove the Thevenin's theorem.

(b) Find the Thevenin equivalent circuit of the circuit shown in Figure-3, to the left of the terminals ab

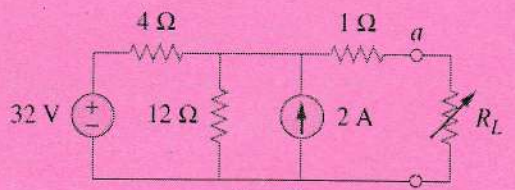

Figure-3

(c) State and prove the maximum transfer theorem for a purely resistive circuit with variable load resistance.

4. (4+3)+5+ (3+5)

(a) Define Graph and Tree of a network. What does a loop and mesh mean?

(b) What are Y and Z parameters in a two port network?

(c) What does a reciprocal and symmetrical network mean? Find out the conditions for a circuit would be reciprocal and symmetrical in terms of Z parameters.

5. 2+ (3+3+3+3) + 6

(a) What does a first order circuit mean?

(b) Define the terms related to a circuit with necessary figure (i) time constant (ii) unit step function (iii) unit impulse function (iv) natural response

(c) The switch in the circuit in Figure-4 has been closed for a long time and is opened at $t = 0$. Find $v(t)$ for $t \geq 0$.

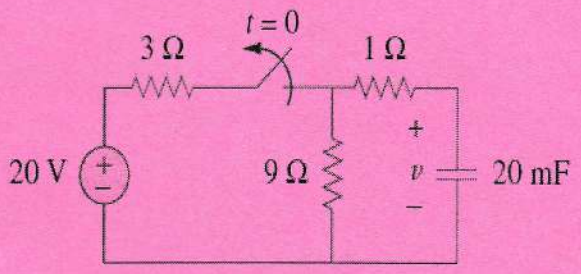

Figure-4

6. Write the short notes on any four 4 X 5 =20

(a)Active and Passive Elements

(b) Dependent sources

(c) Superposition theorem

(d) Hybrid parameters

(e) Super node and super mesh