CBCS SCHEME

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17EE32

Third Semester B.E. Degree Examination, July/August 2021
Electric Circuit Analysis

Time: 3 hrs. Max. Marks: 100

Note: Answer any FIVE full questions.

1 a. Differentiate the following :
(i) Linear and Non-Linear networks
(ii) Active and Passive Elements
(iii) Lumped and Distributed Network.
(iv) Ideal and Practical sources **(04 Marks)**

b. Reduce the given network to a single voltage source in series with a resistance using source shifting and source transformation techniques. [Refer Fig.Q1(b)]

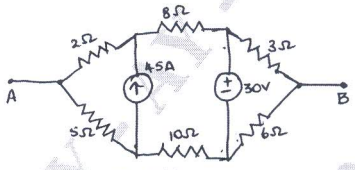

Fig.Q1(b) **(08 Marks)**

c. Find the equivalent resistance between the terminals A and B using star-delta transformation for Fig.Q1(c). **(08 Marks)**

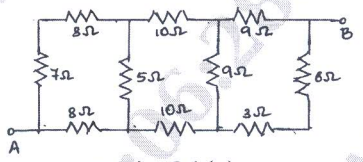

Fig.Q1(c)

2 a. Using Mesh Analysis, find I_x and V_x for the circuit shown in Fig.Q2(a). **(05 Marks)**

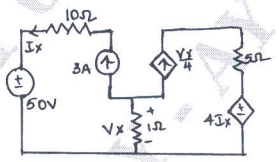

Fig.Q2(a)

b. Apply the nodal voltage technique to obtain the voltages at all nodes for the circuit in Fig.Q2(b).

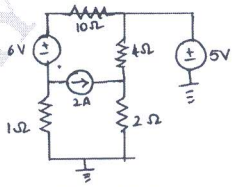

Fig.Q2(b) **(07 Marks)**

c. For the network in Fig.Q2(c), draw the dual and write the mesh and nodal equations.

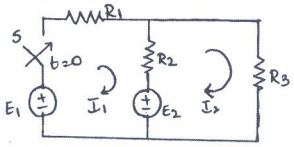

Fig.Q2(c) **(08 Marks)**

3 a. State and prove Superposition theorem. **(06 Marks)**

b. Obtain the Thevnian's equivalent of the network shown in Fig.Q3(b) between terminals X and Y.

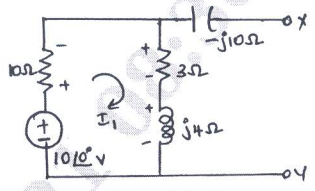

Fig.Q3(b) **(07 Marks)**

c. Find V_{ab} for the circuit in Fig.Q3(c) using superposition principle between terminals a and b.

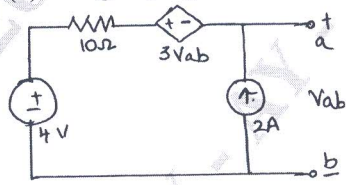

Fig.Q3(c) **(07 Marks)**

4 a. State and prove Maximum Power Transfer theorem. **(06 Marks)**

b. Obtain Norton's Equivalent for the network in Fig.Q4(b) and determine the current through 5 Ω.

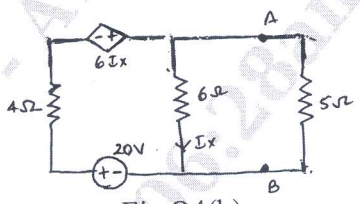

Fig.Q4(b) **(07 Marks)**

c. Find voltage V_x and verify Reciprocity theorem for the network in Fig.Q4(c).

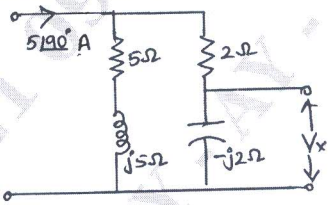

Fig.Q4(c) **(07 Marks)**

5 a. Define the following : **(04 Marks)**

(i) Resonance (ii) Bandwidth (iii) Q factor (iv) Selectivity

b. Show that in a series resonant circuit, the resonant frequency is the geometric mean of the half power frequencies. **(08 Marks)**

c. For the circuit shown in Fig.Q5(c), find the values of capacitor to achieve resonance. Derive the formula used and take f = 50 Hz.

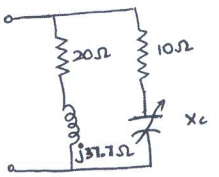

Fig.Q5(c) **(08 Marks)**

6 a. Explain the behavior of circuit elements under switching action [t = 0 and t = ∞]. **(06 Marks)**

b. In the network shown, switch K is closed at t = 0, with the capacitor uncharged. Find the values of i(t), di/dt, d^2i/dt^2 at $t = 0^+$. [Refer Fig.Q6(b)]

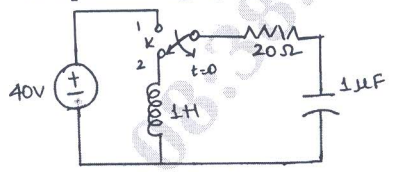

Fig.Q6(b) **(08 Marks)**

c. Derive an expression for transient response of a series RC circuit under DC excitation. **(06 Marks)**

7 a. State and prove initial value and final value theorem. **(08 Marks)**

b. Obtain the Laplace transform of (i) δ(t) (ii) U(t). **(04 Marks)**

c. Using initial and final value theorems, find f(0) and f(∞) for the following :

(i) $\frac{s^3+7s^2+5}{s(s^3+3s^2+4s+2)}$ (ii) $\frac{s(s+4)(s+8)}{(s+1)(s+6)}$ **(08 Marks)**

8 a. Obtain the Laplace transform for the waveform shown in Fig.Q8(a).

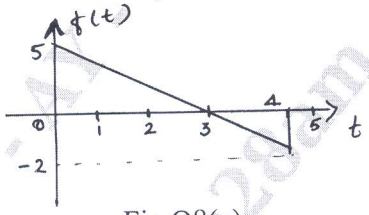

Fig.Q8(a) **(10 Marks)**

b. Synthesize the waveform shown in Fig.Q8(b) and also find its Laplace transform.

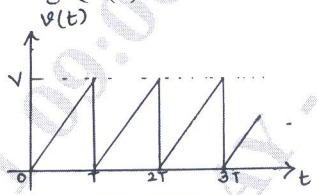

Fig.Q8(b) **(10 Marks)**

9 a. A 3 phase, 3 wire 208 V, ABC system has a star connected unbalanced load with $Z_A = 5\angle 0^\circ$, $Z_B = 5\angle 30^\circ$, $Z_C = 10\angle -60^\circ$. Obtain the line currents and voltages across each impedance, using star-delta transformation technique. **(10 Marks)**

b. Three equal inductors connected in star, take 5 kW at 0.7 power factor when connected to a 400V, 50Hz, 3 phases, 3 wire supply. Calculate the line currents if (i) One of the inductors is disconnected. (ii) One of the inductors is short circuited. **(10 Marks)**

10 a. Explain Z parameters and express Z-parameters in terms of Y parameters. **(10 Marks)**

b. Find the transmission parameters for the bridge circuit shown in Fig.Q10(b).

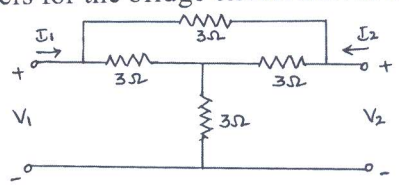

Fig.Q10(b) **(10 Marks)**

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