CBCS SCHEME

USN | | | | | | | | | | 15EE32

Third Semester B.E. Degree Examination, July/August 2022
Electric Circuit Analysis

Time: 3 hrs. Max. Marks: 80

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. In the network shown in Fig.Q1(a), find the current in R_L using the concept of source transformation.

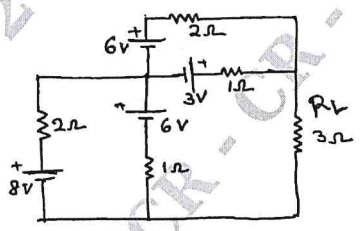

Fig.Q1(a) **(05 Marks)**

b. Find the equivalent resistance of the circuit between a - b as shown in Fig.Q1(b).

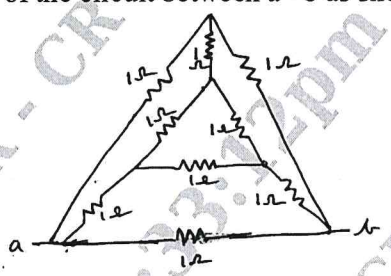

Fig.Q1(b) **(06 Marks)**

c. Using mesh analysis, find the magnitude of the current dependent voltage source in the network shown in Fig.Q1(c).

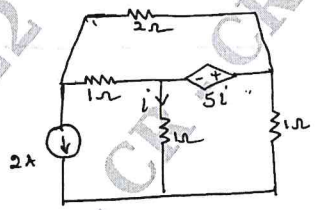

Fig.Q1(c) **(05 Marks)**

OR

2 a. Find the node voltages V_1 , V_2 and V_3 in the circuit diagram shown in Fig.Q2(a), using Nodal Analysis.

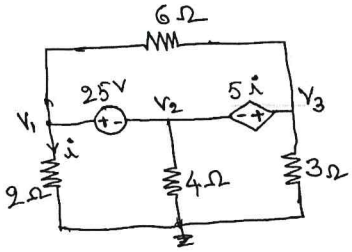

Fig.Q2(a) **(06 Marks)**

b. Obtain the dual of the network in Fig.Q2(b).

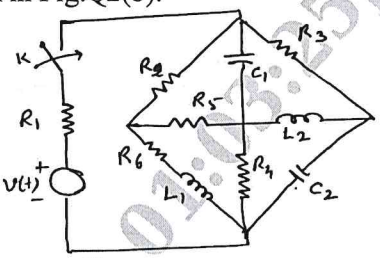

Fig.Q2(b) **(04 Marks)**

c. A variable frequency constant voltage signal generator supplies a RLC circuit at sinusoidal mode. Find the frequency at which maximum voltage across the inductor would appear. **(06 Marks)**

Module-2

3 a. Find the power loss in 5 Ω resistor by superposition theorem in Fig.Q3(a).

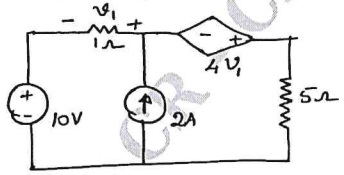

Fig.Q3(a) **(06 Marks)**

b. State and verify Reciprocity theorem. **(04 Marks)**

c. For the circuit shown in Fig.Q3(c), find the value of R_L that will receive maximum power. Determine this power.

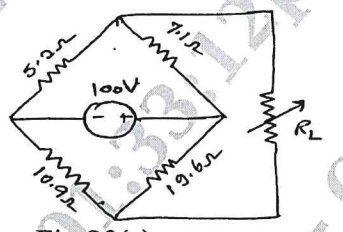

Fig.Q3(c) **(06 Marks)**

OR

4 a. State and prove Millman's theorem. **(05 Marks)**

b. In the circuit shown in Fig.Q4(b), find the Thevenin's equivalent circuit across the terminals A and B.

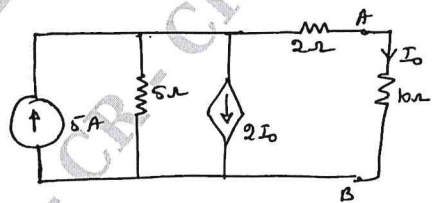

Fig.Q4(b) **(06 Marks)**

c. Obtain Norton's equivalent for the circuit shown in Fig.Q4(c).

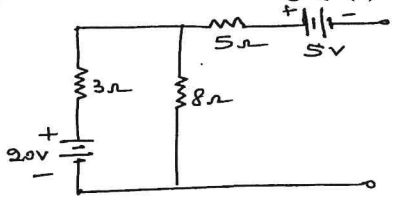

Fig.Q4(c) **(05 Marks)**

Module-3

5 a. A D.C. voltage of 100V is applied in the circuit of Fig.Q5(a) and switch K is open. The switch K is closed at t = 0. Find the complete expression for the current.

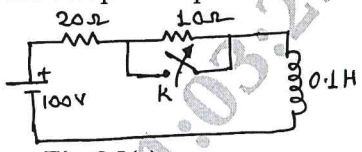

Fig.Q5(a) **(08 Marks)**

b. In the network shown in Fig.Q5(b) has two independent node pairs. The switch K is opened at t = 0. Find the V_1, V_2, $\frac{d}{dt}V_1$ and $\frac{d}{dt}V_2$ at $t = 0_+$.

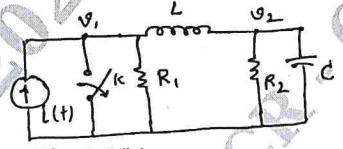

Fig.Q5(b) **(08 Marks)**

OR

6 a. In the network shown in Fig.Q6(a), switch K is changed form position a to b at t = 0. Solve for i, $\frac{d}{dt}i$ and $\frac{d^2}{dt^2}i$ at $t = 0_+$.

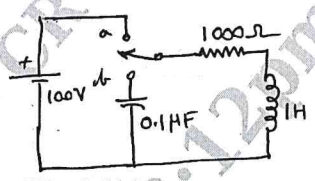

Fig.Q6(a) **(06 Marks)**

b. Steady state is reached in the circuit shown in Fig.Q6(b) when the switch is at 1. At = 0, the switch is moved to 2. Find the drop across the capacitor as well as across the capacitor. Also find the energy stored in the capacitor at t = 0.1 msec.

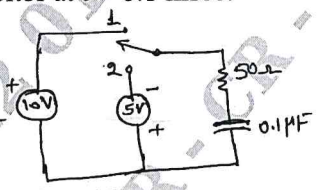

Fig.Q6(b) **(10 Marks)**

Module-4

7 a. State and prove initial and final value theorem. **(06 Marks)**

b. Represent the function shown in Fig.Q7(b) using step and ramp function. Hence determine its Laplace transform.

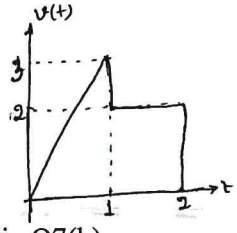

Fig.Q7(b) **(05 Marks)**

c. Find the initial and final values of i(t) using initial and final value theorems

$$I(s) = \frac{(s+1)}{(s^2+2s)}$$ **(05 Marks)**

OR

8 a. In the network shown in Fig.Q8(a), the switch K is closed at t = 0. Find $i_2(t)$ using Laplace transformation technique.

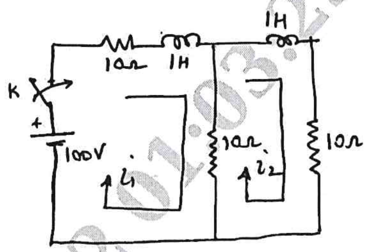

Fig.Q8(a) **(08 Marks)**

b. In a series L-C circuit, the supply voltage being $V = V_m \cdot \cos(t)$, find i(t) at $t = 0_+$ following switching at t = 0 with zero initial conditions. [Refer Fig.Q8(b)] **(08 Marks)**

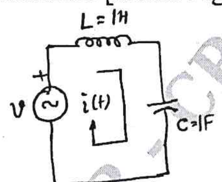

Fig.Q8(b)

Module-5

9 a. In a star connected unbalanced system of impedances of 20 Ω, 16+j12 Ω and 6 – j12 Ω in the phases a, b, and c is being supplied by a 400 V balanced, 3 phase generator with phase sequence abc. Determine the line currents and the power supplied to the load, when the neutrals are connected. **(05 Marks)**

b. Define ABCD parameters. **(04 Marks)**

c. Find Y-parameters of the network shown in Fig.Q9(c), from Z-parameters.

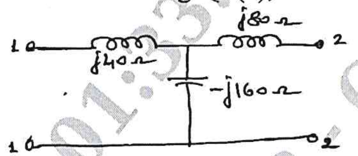

Fig.Q9(c) **(07 Marks)**

OR

10 a. Obtain transmission parameters of the network shown in Fig.Q10(a).

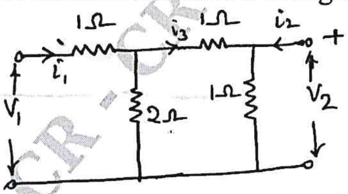

Fig.Q10(a) **(08 Marks)**

b. Find the expression of voltage transfer ratio for the network shown in Fig.Q10(b).

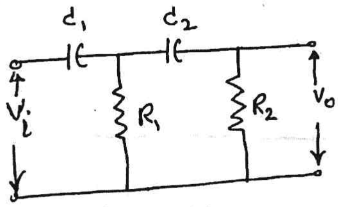

Fig.Q10(b) **(08 Marks)**

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