CBCS SCHEME

USN

18EE32

Third Semester B.E. Degree Examination, June/July 2023
Electric Circuit Analysis

Time: 3 hrs. Max. Marks: 100

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

Module-1

1 a. Reduce the given network to a single voltage sources in series with a resistance using source transformation for Fig. Q1 (a).

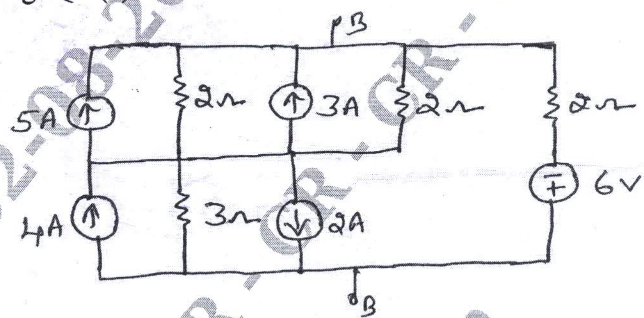

Fig. Q1 (a) **(08 Marks)**

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

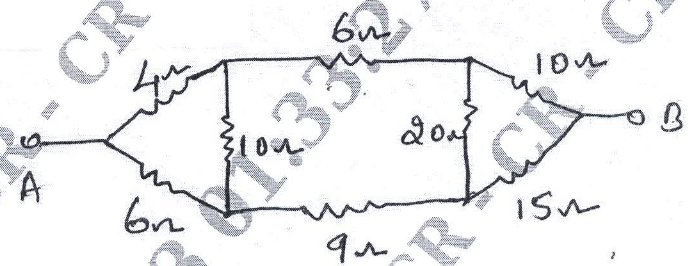

Fig. Q1 (b) **(06 Marks)**

c. Use Mesh Current Analysis to find the current through in 5 Ω resistant of circuit shown in Fig. Q1 (c).

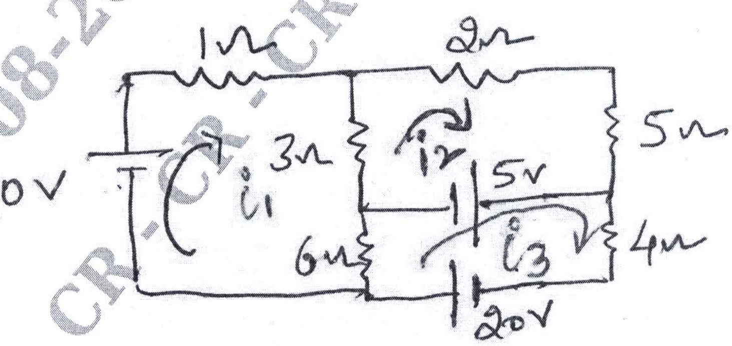

Fig.Q1 (c) **(06 Marks)**

OR

2 a. Using Mesh current analysis, find the value of V such that current through $(2+j3)\Omega$ is zero for Fig. Q2 (a).

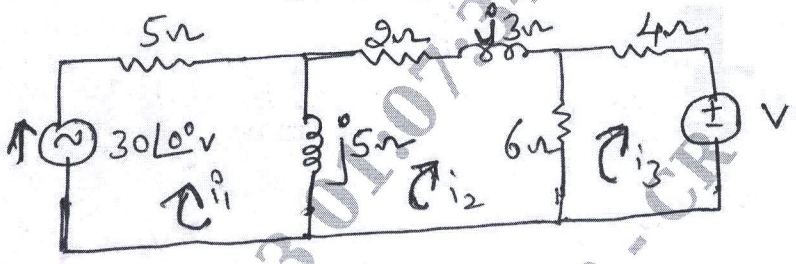

Fig. Q2 (a) **(06 Marks)**

b. Find all the node voltages for the network shown in Fig. Q2 (b).

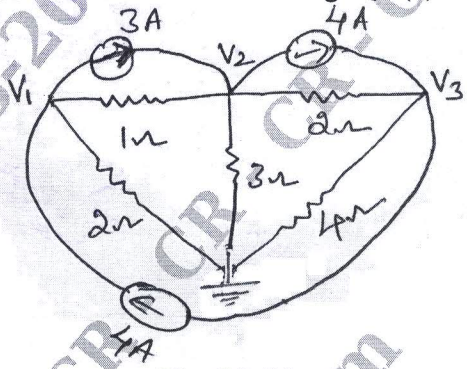

Fig. Q2 (b) **(08 Marks)**

c. Find all the node voltages for the Network shown in Fig.Q2 (c).

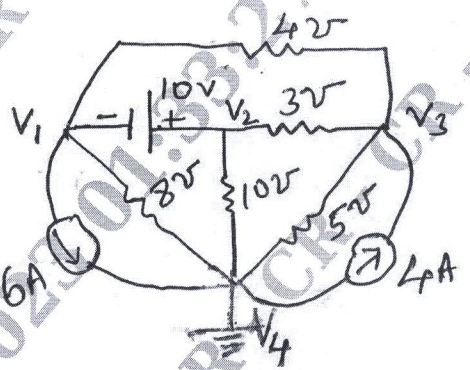

Fig.Q2 (c) **(06 Marks)**

Module-2

3 a. State and explain Millman's theorem. **(06 Marks)**

b. Find the current through 2Ω resistance in the network shown below Fig. Q3 (b) using superposition theorem.

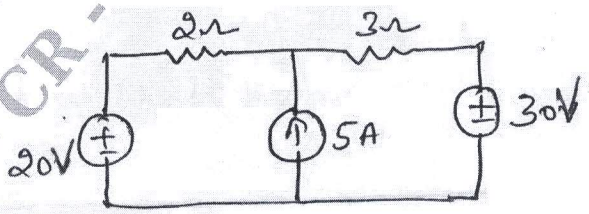

Fig. Q3 (b) **(08 Marks)**

c. Verify the Reciprocity theorem for the circuit shown in Fig.Q3 (c) by finding I.

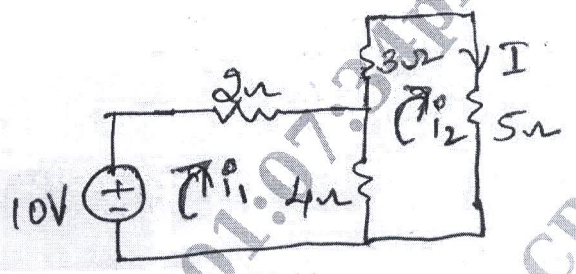

Fig. Q3 (c) **(06 Marks)**

OR

4 a. Obtain the Thevenin's equivalent of the Network shown in Fig.Q4 (a) between terminals A and B.

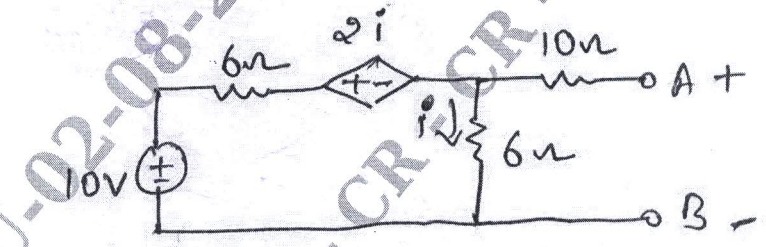

Fig. Q4 (a) **(10 Marks)**

b. Obtain Norton's Equivalent for the network shown in Fig.Q4 (b) and determine the current through 20 Ω.

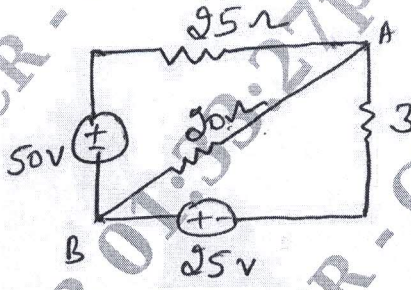

Fig.Q4 (b) **(10 Marks)**

Module-3

5 a. Show that resonant frequency is the geometric mean of cut-off frequencies. **(08 Marks)**

b. A series RLC circuit has R = 10 Ω, L = 0.01 H and C = 0.01 μF. Calculate Q factor, bandwidth, resonant frequency and half power frequencies. **(08 Marks)**

c. Determine the value of R_L and R_C for which the circuit shown in Fig. Q5 (c) resonance at all frequencies.

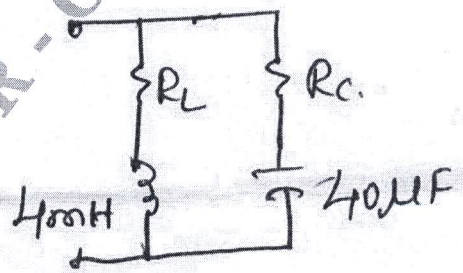

Fig. Q5 (c) **(04 Marks)**

OR

6 a. Explain the behavior of R, L and C for initial conditions and final conditions. **(07 Marks)**

b. In the network shown in Fig. Q6 (b), if switch is closed at $t = 0$. Determine the current and its first and second derivative at $t = 0^+$.

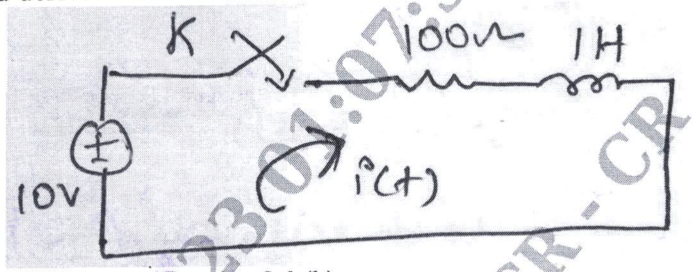

Fig. Q6 (b) **(06 Marks)**

c. In the network Fig. Q6 (c), the switch is moved from position 1 to position 2 at $t = 0$. The steady state has been reached before switching. Calculate i, $\frac{di}{dt}$ and $\frac{d^2i}{dt^2}$ at $t = 0^+$.

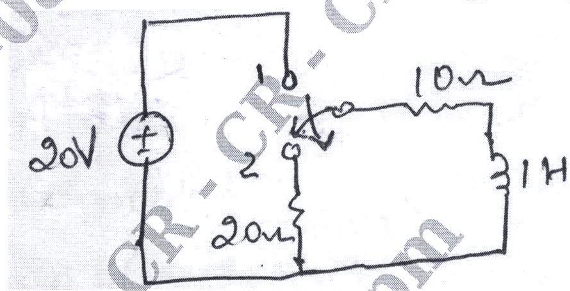

Fig. Q6 (c) **(07 Marks)**

Module-4

7 a. Find the Laplace transform of the,

(i) $x_1(t) = \cos\omega t$

(ii) $x_2(t) = u(t)$.

(iii) $x_3(t) = t$

(iv) $x_u(t) = e^{-at} \sin \omega t$ **(08 Marks)**

b. Find the Inverse Laplace transform of the following :

(i) $F(s) = \frac{s+2}{s(s+3)(s+4)}$.

(ii) $F(s) = \frac{(s-2)}{s(s+1)^3}$ **(06 Marks)**

c. Obtain the Laplace transform of the Gate function shown in Fig. Q7 (c).

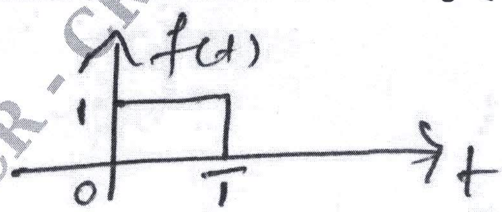

Fig. Q7 (c) **(06 Marks)**

OR

8 a. State and prove initial value theorem and final value theorem. **(10 Marks)**

b. Find the initial and final value of the following functions :

(i) $I_1(s) = \dfrac{6.67(s+250)}{s(s+166.7)}$

(ii) $I_2(s) = \dfrac{6.67}{s+166.7}$. **(10 Marks)**

Module-5

9 a. A 3 phase, 400 V, 4 wire system has a star connected load with $Z_A = 10\angle 0^\circ\,\Omega$, $Z_B = (15 + j10)\Omega$, $Z_C = (0 + j5)\Omega$. Find the line current and current through neutral conductor for phase sequence ABC for Fig. Q9 (a).

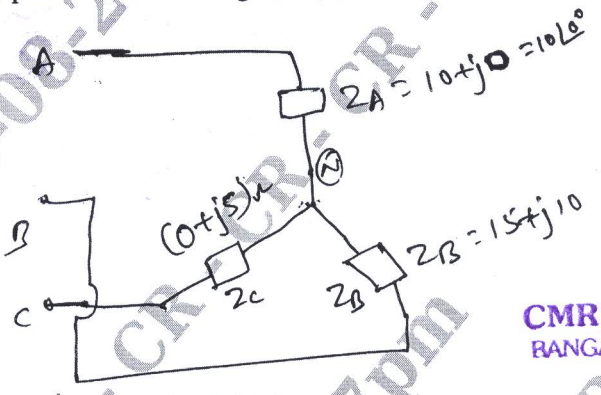

Fig. Q9 (a) **(10 Marks)**

b. Obtain Y-parameters in terms of ABCD parameters. **(10 Marks)**

OR

10 a. Determine the Z-parameters and Y-parameters for the circuit shown in Fig. Q10 (a).

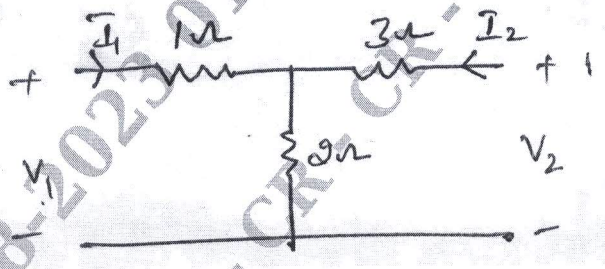

Fig. Q10 (a) **(10 Marks)**

b. The impedance parameters of a 2 port network are $Z_{11} = 6\ \Omega$, $Z_{22} = 4\ \Omega$, $Z_{12} = Z_{21} = 3\ \Omega$. Compute the Y-parameters and ABCD parameters. **(10 Marks)**

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