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).

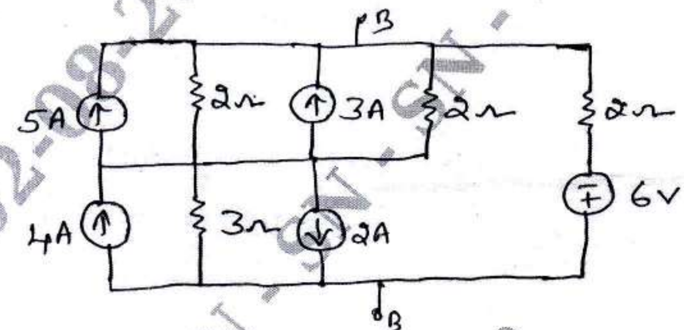

Fig. Q1 (a) **(08 Marks)**

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

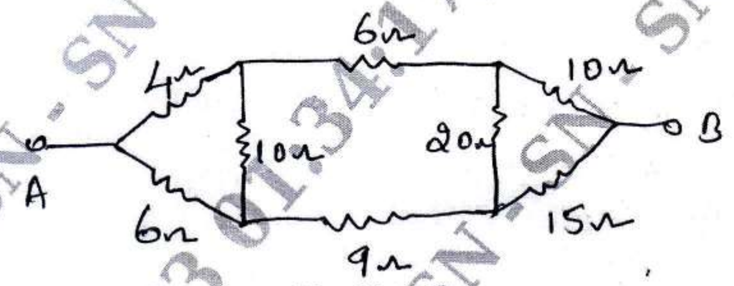

Fig. Q1 (b) **(06 Marks)**

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

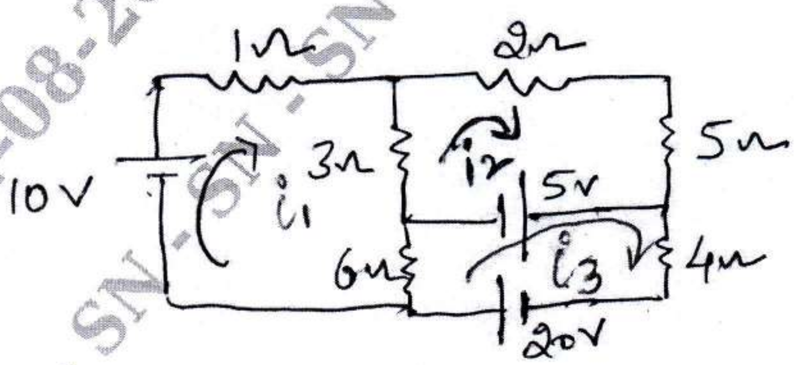

Fig.Q1 (c) **(06 Marks)**

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).

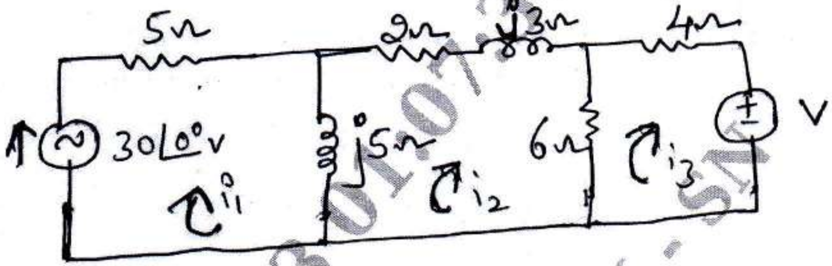

Fig. Q2 (a)

(06 Marks)

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

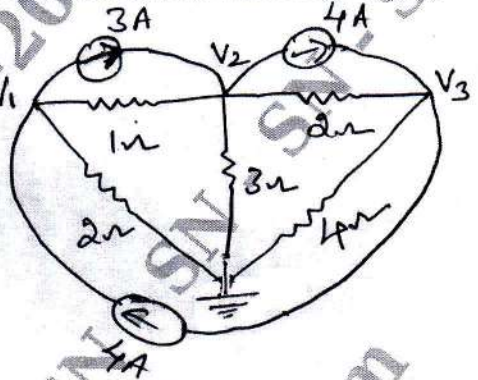

Fig. Q2 (b)

(08 Marks)

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

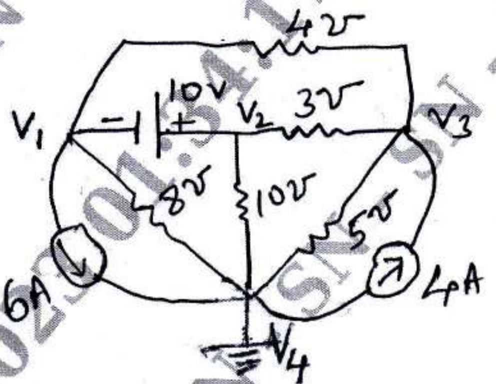

Fig.Q2 (c)

(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.

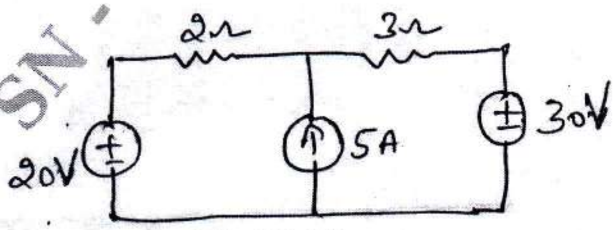

Fig. Q3 (b)

(08 Marks)

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

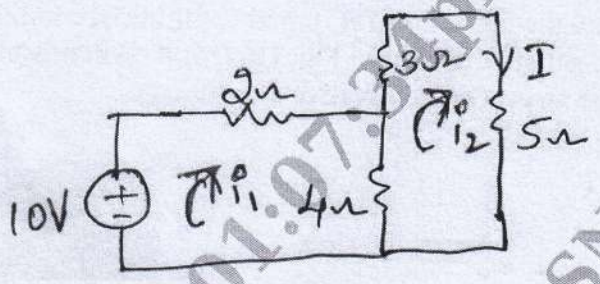

Fig. Q3 (c) **(06 Marks)**

OR

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

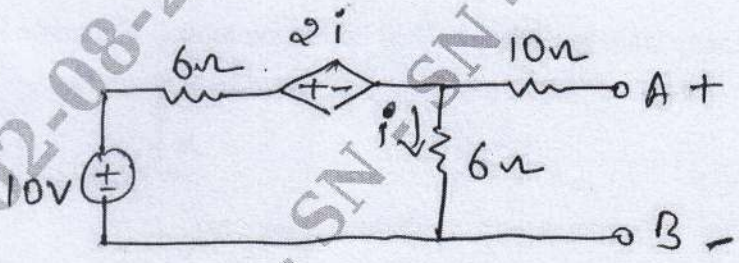

Fig. Q4 (a) **(10 Marks)**

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

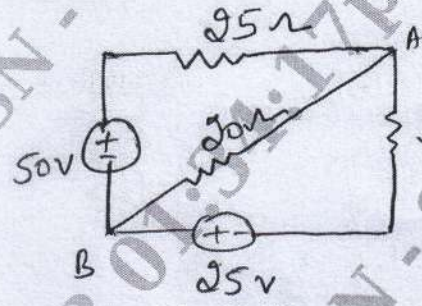

Fig.Q4 (b) **(10 Marks)**

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.

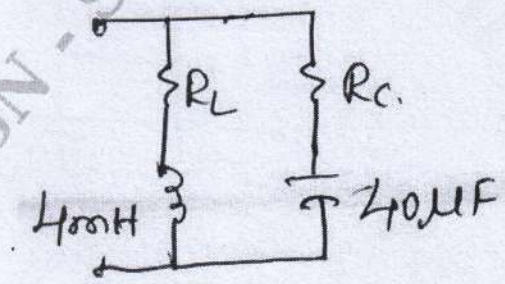

Fig. Q5 (c) **(04 Marks)**

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 $t = 0^+$.

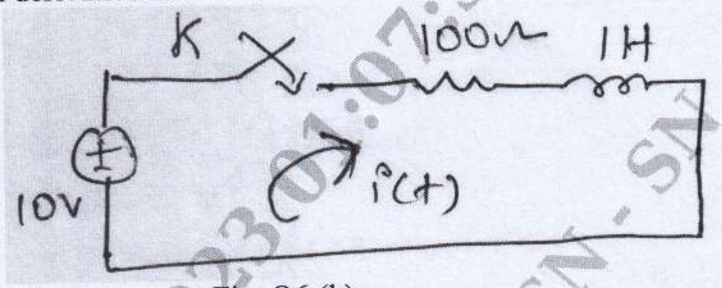

Fig. Q6 (b) **(06 Marks)**

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 $t = 0^+$.

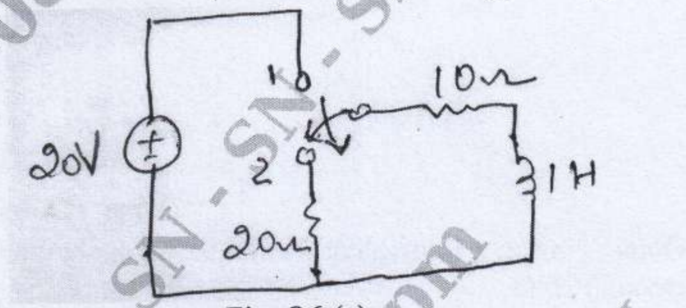

Fig. Q6 (c) **(07 Marks)**

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).

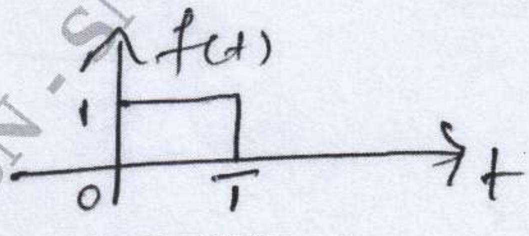

Fig. Q7 (c) **(06 Marks)**

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).

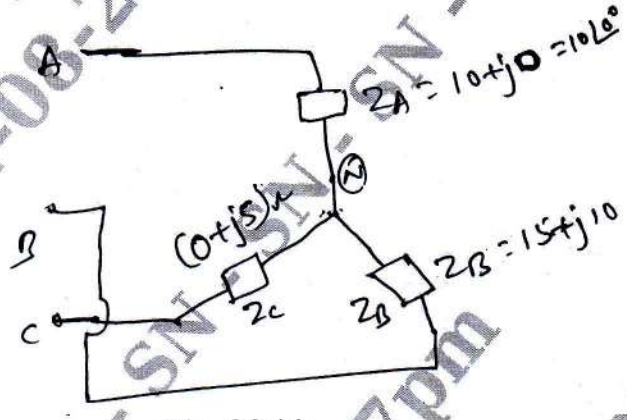

Fig. Q9 (a) **(10 Marks)**

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).

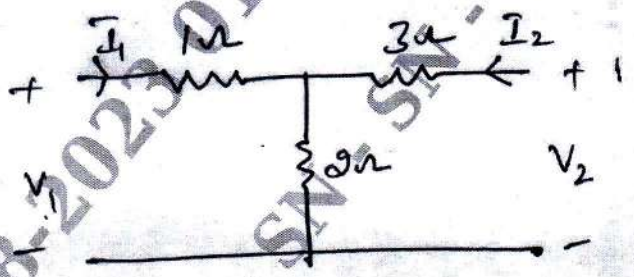

Fig. Q10 (a) **(10 Marks)**

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)**

* * * * *