CBCS SCHEME

USN

18EC32

Third Semester B.E. Degree Examination, June/July 2023
Network Theory

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 network shown in Fig. Q1 (a) to a single voltage source in series with a resistance between the terminals A and B.

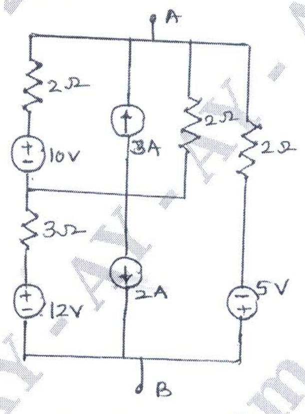

Fig. Q1 (a) **(10 Marks)**

b. Determine the equivalent resistance between X, Y in the network shown in Fig. Q1 (b) using star-delta conversion.

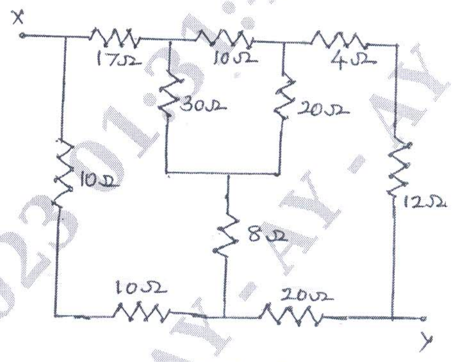

Fig. Q1 (b) **(10 Marks)**

OR

2 a. Determine the current I in the circuit shown in Fig. Q2 (a), using mesh analysis.

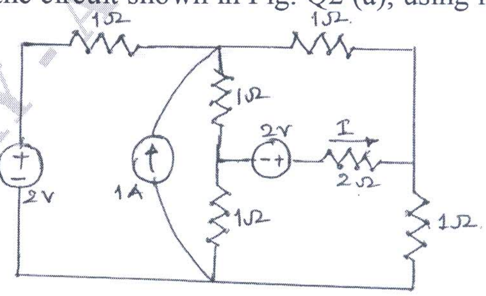

Fig. Q2 (a) **(10 Marks)**

b. Determine the power supplied to the circuit shown in Fig. Q2 (b) by source $50\angle 0° V$. And also find the power dissipated by each resistor in the circuit, using nodal analysis.

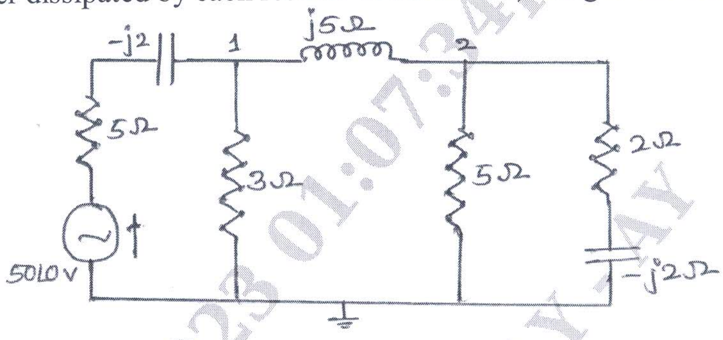

Fig. Q2 (b) **(10 Marks)**

Module-2

3 a. In the network shown in Fig. Q3 (a), two voltage sources act on the load impedance connected to the terminals A, B. If this load is variable in both reactance and resistance, what load Z_L will receive maximum power? What is the value of the maximum power?

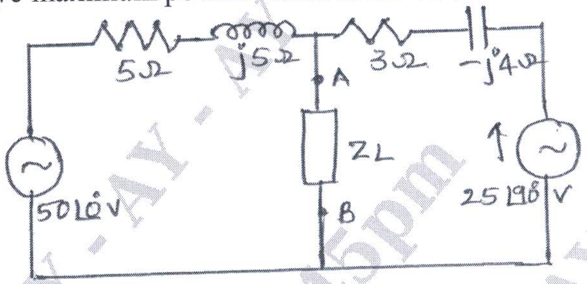

Fig. Q3 (a) **(10 Marks)**

b. Find the output voltage E_o for the circuit shown in Fig. Q3 (b) using Millman's theorem.

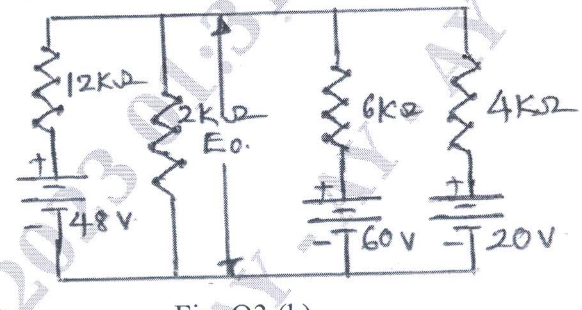

Fig. Q3 (b) **(10 Marks)**

OR

4 a. Obtain Thevenin's and Norton's equivalent for the network shown in Fig. Q4 (a).

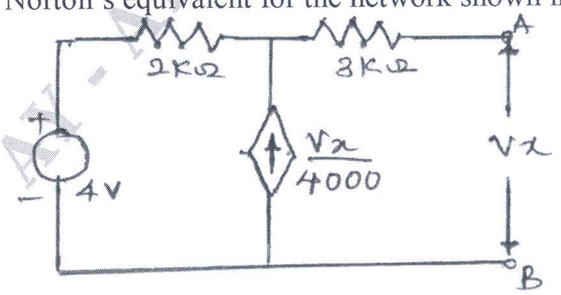

Fig. Q4 (a) **(10 Marks)**

b. Determine the current through an ammeter having internal resistance of 10 Ω in the network shown in Fig. Q4 (b) using superposition theorem. Verify the answer using loop current analysis.

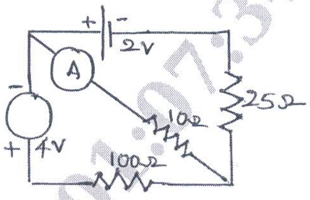

Fig. Q4 (b) **(10 Marks)**

Module-3

5 a. In the network shown in Fig. Q5 (a), steady state has been reached with the switch K on position A. The switch is moved to position B at t = 0. Determine at t(0^+) the values of i, $\frac{di}{dt}$ and $\frac{d^2i}{dt^2}$.

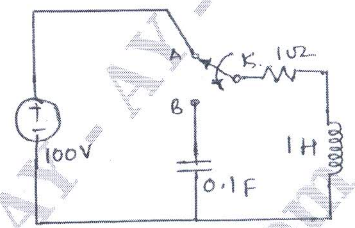

Fig. Q5 (a) **(10 Marks)**

b. Explain the importance of study of initial conditions in electric circuit analysis and also explain the behavior of R, L and C elements for transients. **(10 Marks)**

OR

6 a. In RLC series circuit shown in Fig. Q6 (a), find i(0^+), $\frac{di}{dt}(0^+)$ and $\frac{d^2i}{dt^2}(0^+)$, if switch is closed at t = 0.

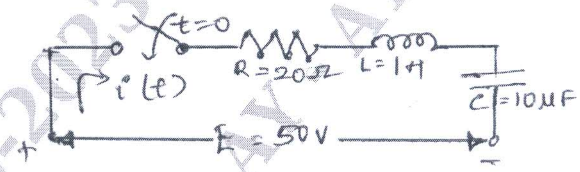

Fig. Q6 (a) **(10 Marks)**

b. In the circuit shown in Fig. Q6 (b) switch K is changed from position 1 to 2 at t = 0, having been reached steady state before switching. Evaluate, i, $\frac{di}{dt}$ and $\frac{d^2i}{dt^2}$ at t = 0^+.

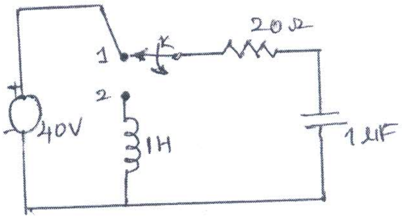

Fig. Q6 (b) **(10 Marks)**

Module-4

7 a. State and prove,
  (i) Initial value theorem.
  (ii) Final value theorem. **(10 Marks)**

b. Find the Laplace transforms of following functions :
  (i) Unit step function.
  (ii) $f(t) = e^{at}$ **(10 Marks)**

OR

8 a. Assuming that the staircase wave of Fig. Q8 (a) is not repeated, find its Laplace transform. If this voltage wave is applied to a RL series circuit, with R = 1 Ω and L = 1 H, find the current i(t).

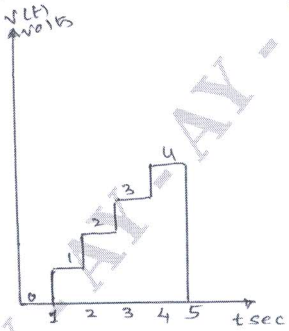

Fig. Q8 (a) **(10 Marks)**

b. The network shown in Fig. Q8 (b) was in steady state before t = 0. The switch is opened at t = 0. Find i(t) for t > 0, using Laplace transform.

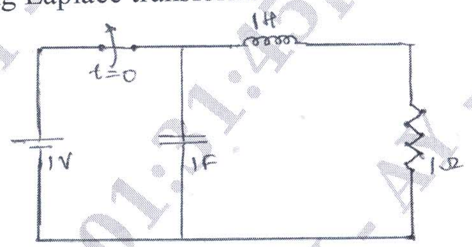

Fig. Q8 (b) **(10 Marks)**

Module-5

9 a. Define the following terms with reference to resonance circuit:
  (i) Resonance
  (ii) Q-factor
  (iii) Selectivity
  (iv) Band width **(06 Marks)**

b. Determine R_L and R_C for which the circuit shown in Fig. Q9 (b) resonates at all frequencies.

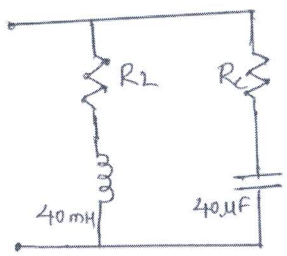

Fig. Q9 (b) **(04 Marks)**

c. Obtain the H-parameters for the network shown in Fig. Q9 (c).

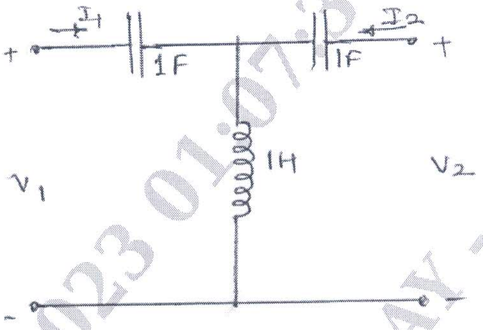

Fig. Q9 (c) **(10 Marks)**

OR

10 a. Obtain ABCD parameters interms of Z-parameters and hence show that AD – BC = 1. **(10 Marks)**

b. A series RLC circuit has $R = 10\ \Omega$, $L = 0.0$ H and $C = 0.01\ \mu F$ and it is connected across 10 mV supply.
Calculate (i) f_0 (ii) Q_0 (iii) Bandwidth (iv) f_1 and f_2 (v) I_0 **(10 Marks)**

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