BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(MID SEMESTER EXAMINATION)

CLASS: BTECH — **SEMESTER: III**
BRANCH: EEE — **SESSION: MO/2022**

SUBJECT: EE205 CIRCUIT THEORY

TIME: 2 HOURS — **FULL MARKS: 25**

INSTRUCTIONS:
1. The total marks of the questions are 25.
2. Candidates may attempt for all 25 marks.
3. Before attempting the question paper, be sure that you have got the correct question paper.
4. The missing data, if any, may be assumed suitably.

Q1 (a) Define 1) branch incidence 1) I-shift 2) cut set 3) branch incidence 4) twigs [2]

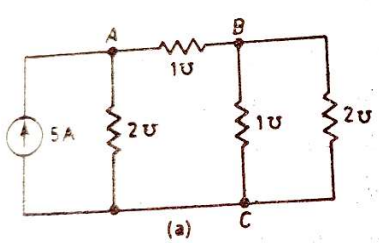
Q1 (b) The branch current and loop current relations are expressed in matrix form as: [3]

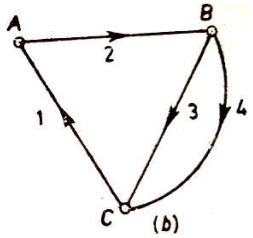
$$\begin{bmatrix} i_1 \\ i_2 \\ i_3 \\ i_4 \\ i_5 \\ i_6 \\ i_7 \\ i_8 \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 & -1 \\ 0 & 1 & 0 & -1 \\ 0 & 1 & 1 & 0 \\ 0 & 1 & 1 & 0 \\ 1 & -1 & 0 & 0 \\ 0 & 0 & -1 & 0 \\ -1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} I_1 \\ I_2 \\ I_3 \\ I_4 \end{bmatrix}$$

(1 2 3 4 5 6 7)

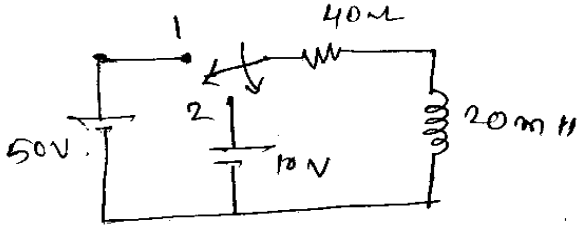
Draw the orientation graph

Q2 (a) For the network shown below, write the f-cut-set matrix when branch 1 and 3 acting as twigs and obtain the equilibrium equation on node-basis. [5]



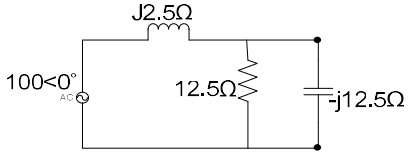


Q2 (b) The network is under steady state with switch at position 1. At t=0 switch is moved to position 2. Find i(t)? [5]



Q3 (a) State Substitution Theorem and Verify the Tellegen's theorem for the Kth branch network. [2+3]

Q3 (b) Verify the reciprocity theorem for the circuit shown below. [5]



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