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

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

SUBJECT: EE205 CIRCUIT THEORY

TIME: 3:00 Hours **FULL MARKS: 50**

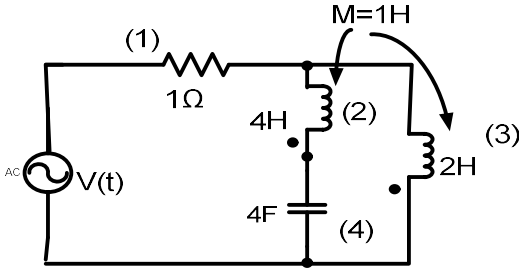
INSTRUCTIONS:
1. The question paper contains 5 questions each of 10 marks and total 50 marks.
2. Attempt all questions.
3. The missing data, if any, may be assumed suitably.
***4*. Before attempting the question paper, be sure that you have got the correct question paper.**
5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.

Q.1(a) i. Define 1) v-shift 2) f-loop 3) branch incidence 4) twigs [2+3]

ii. Branch current and loop current relation are expressed in matrix form as:

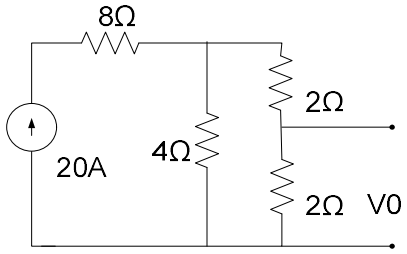
$$\begin{bmatrix} i_1 \\ i_2 \\ i_3 \\ i_4 \\ i_5 \\ i_6 \\ i_7 \\ i_8 \end{bmatrix} = \begin{bmatrix} 0 & 0 & 1 & 0 \\ -1 & -1 & -1 & 0 \\ 0 & 1 & 0 & 0 \\ 1 & 0 & 0 & 0 \\ 0 & 0 & -1 & -1 \\ 1 & 1 & 0 & -1 \\ 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} I_1 \\ I_2 \\ I_3 \\ I_4 \end{bmatrix}$$

Q.1(b) Draw the graph of the network shown in fig formulate the cutest matrix, write the equilibrium equation in matrix form on node basis [5]



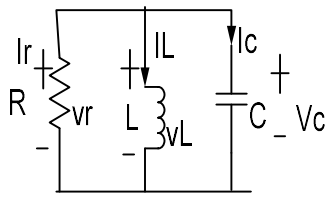
Q.2(a) i. Prove the Tellegen's Theorem for K[th] branch [2+3]

ii. Verify the reciprocity theorem for the circuit shown below.



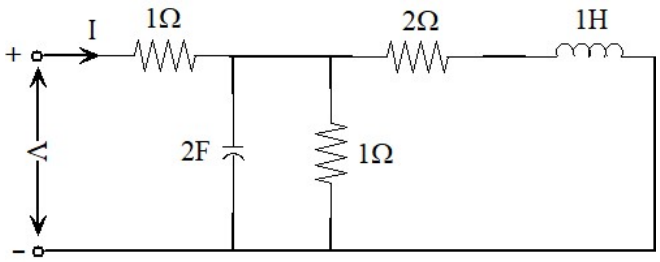
Q.2(b) Prove the property of STM $\phi(t_2 - t_1)\phi(t_1 - t_0) = \phi(t_2 - t_0)$ for any t_0, t_1,t_2 [2+3]

Obtain the state equation for the zero input networks shown in fig state variables are I_L and V_C

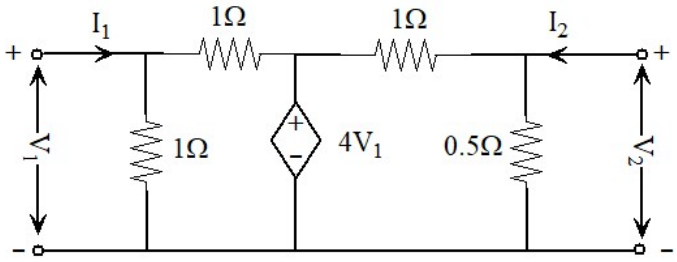


PTO

Q.3(a) Find the driving point impedance, OCNF and SCNF of the following circuit. [2+3]



Q.3(b) Find the open circuit -parameter matrix of the following network. [5]



Q.4(a) What is the positive real function? [5]
Test whether the following function is prf:

$$F(s) = 2s^4 + 7s^3 + 11s^2 + 12s + 4$$

Q.4(b) Synthesize the function in couer form II : [5]

$$Y(s) = \frac{(s^2+2)(s^2+20)}{s(s^2+12)}$$

Q.5(a) Write the difference between Butterworth polynomial and Chebysev polynomial. [5]

Q.5(b) The specification for LP filter are: [5]

$\alpha_p \leq 1dB$ for $f \leq 2MHz$

$\alpha_s \geq 40dB$ for $f \geq 8MHz$ determine n and t for Butterworth and Chebychev polynomials.

:::::24/11/2022:::::E