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

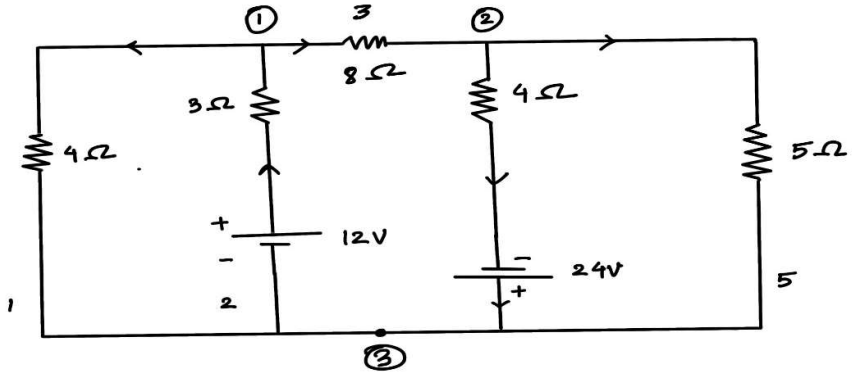
CLASS: BTECH **SEMESTER : III/ADD**
BRANCH: ECE **SESSION : MO/2024**

SUBJECT: EC209 NETWORK THEORY

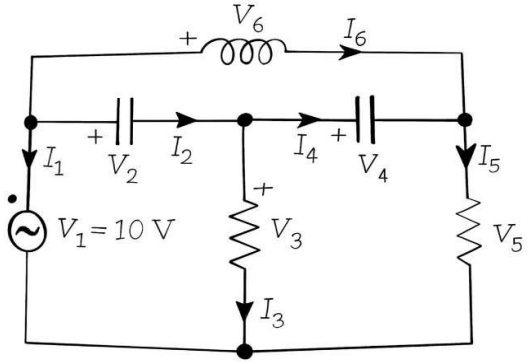
TIME: 3 Hours **FULL MARKS: 50**

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.**

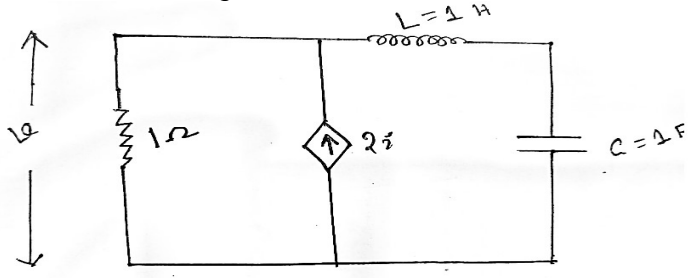
			CO	BL
Q.1(a)	Define the terminologies (i) Cut-set (ii) Tie-set (v) Oriented Graph (iv) Reduced incidence matrix (iv) Isomorphism. Write the relation between number of branches, links and nodes.	[5]	1	2
Q.1(b)	For the given network in the figure below, draw the graph. Consider the branch having resistance of 4 ohms and voltage source 24 volts in series as branch 4. The branch numbers are marked with integers and node numbers are encircled. Using KCL equation in the topological form involving branch admittance matrix, determine the node voltages and branch voltages.	[5]	1	3



Q.2(a)	In the given network, V_1=10V, V_2=4V, V_4=6V. Also, it is given that I_1=2A=I_2 while, I_3=4A. Check the validity of Tellegen's theorem.	[5]	2	3

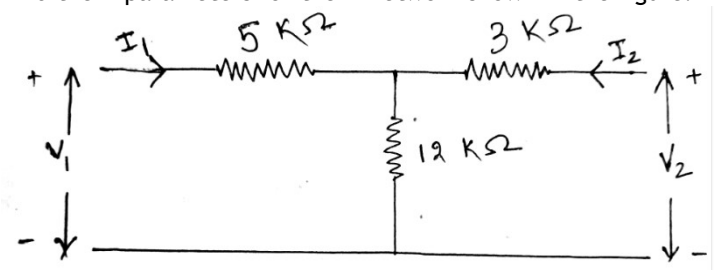


Q.2(b)	What do you mean by 'state' and state variables ? Form the state matrix equation for the network shown in the figure.	[5]	2	3

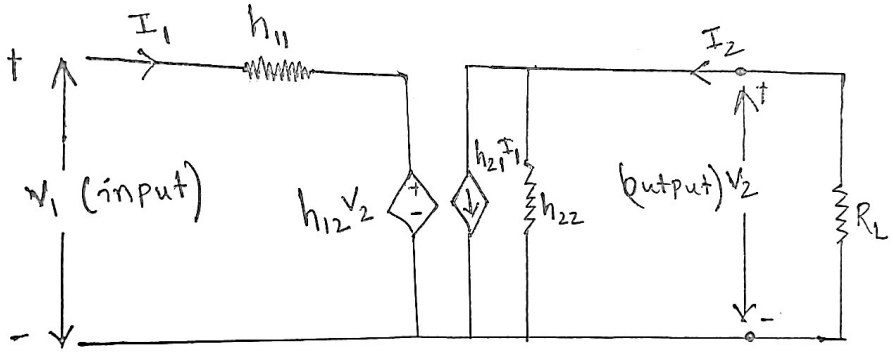


PTO

Q.3(a) Find the Z-parameters for the T-network shown in the figure. [5] 2,3 2



Q.3(b) Find the voltage gain in the given h-parameter equivalent network shown in the figure below. Assume R_L as load resistance and voltage across it as V_2. [5] 2,3 4

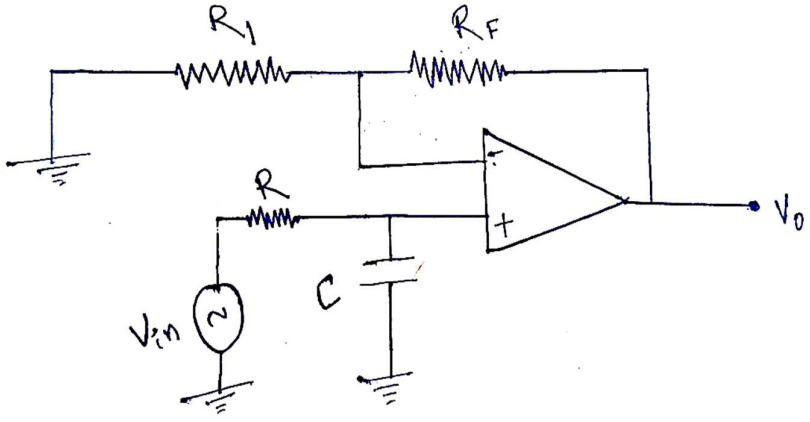


Q.4(a) Determine whether the given polynomials are Hurwitz or not. [5] 3,4 4
(a)$P(S)=s^4+s^3+5s^2+3s+4$
(b)$P(S)= s^4+s^3+2s^2+4s+1$

Q.4(b) The driving point impedance function of the network is given by: [5] 3,4 4
$Z(s)= K(S^2+1)(S^2+9) / S(S^2+4)$
If $Z(-2)= -130/16$, synthesize the impedance in Foster-II.

Q.5(a) The driving point impedance function of the network is given by: [5] 4,5 4
$Z(s)= (S+1)(S+4) / S(S+2)(S+5)$.
Find the R-C representation of Cauer-I form.

Q.5(b) Derive the Transfer Function of the given first order active low pass Butterworth filter. [5] 4,5 4



:::::22/11/2024 E:::::