Basavarajeswari Group of Institutions

BALLARI INSTITUTE OF TECHNOLOGY & MANAGEMENT

(Autonomous Institute under Visvesvaraya Technological University, Belagavi)

USN											Course Code	2	1	E	C	4	2

Fourth Semester B.E. Degree Examinations, September 2024

NETWORK THEORY AND CONTROL SYSTEMS

Duration: 3 hrs **Max. Marks: 100**

Note: ***1. Answer any* FIVE *full questions, choosing* ONE *full question from each module.***
2. Missing data, if any, may be suitably assumed.

Q. No		***Question***	***Marks***	*(RBTL:CO:PI)*
		MODULE – 1		
1.	**a.**	Find the current through 4 Ω resistor as shown in Fig. 1(a) by using loop current method.	**10**	(3 :1 : 2.1.3)

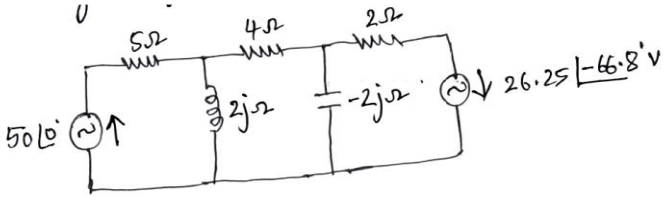


Fig. 1(a)

	b.	Use Mesh Analysis, determine what value of V2 in the network shown in Fig. 1(b) causes the voltage v = 0 volts across the 20 Ω resistor.	**10**	(3 :1 : 2.1.3)

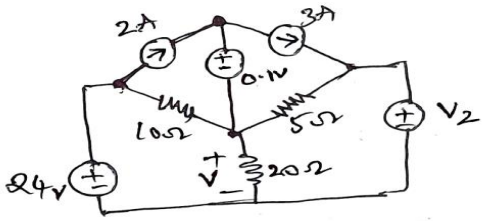


Fig. 1(b)

OR

2.	**a.**	Find the current in all the resistors by node voltage method as shown in Fig. 2(a). Also write the steps involved in digital simulation.	**10**	(3 :5 : 5.2.2)

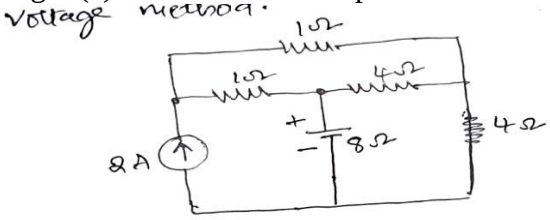
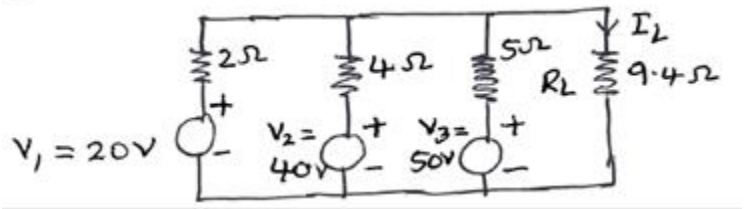


Fig. 1 (c)

	b.	Using Milliman's theorem find I_L for the network shown in the Fig. 2(a).	**10**	(3 :5 : 5.2.2)



		MODULE – 2		
3.	**a.**	Derive the expression for Y-parameters in terms of (i) Z parameters (ii) H-parameters (iii) Transmission Parameters	**10**	(3 :1 : 2.1.3)

Note: (**RBTL - Revised Bloom's Taxonomy Level: CO - Course Outcome: PI - Performance Indicator)**

	b.	Apply the Laplace Transform to obtain the response of current i(t) in the circuit shown in Fig. 3(b).	**10**	(3 :1 : 2.1.3)

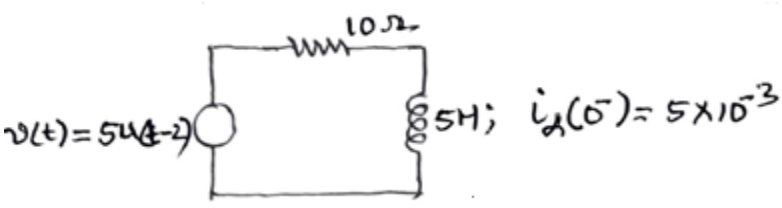


Fig. 3(b)

OR

4.	**a.**	Find the Laplace transform for the wave form shown in Fig. 4 (a).	**10**	(3 :1 : 2.1.3)

Fig. 4(a)

	b.	Determine Y-parameters for the network shown in the Fig. 4 (b).	**10**	(3 :1 : 2.1.3)

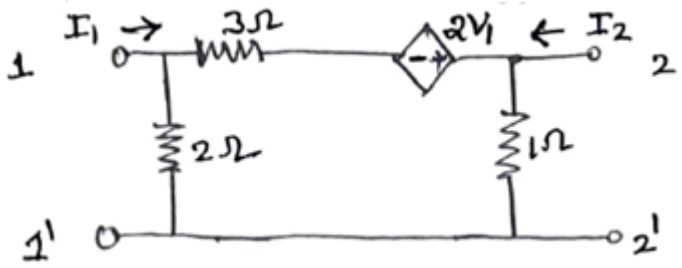


Fig. 4(b)

MODULE – 3

5.	**a.**	Define control system and explain with an example	**10**	(3 :2 : 2.1.3)
	b.	For the Rotational system shown in Fig. 5 (b), draw the electrical network based on T-I analogy.	**10**	(3 :2 : 2.1.3)

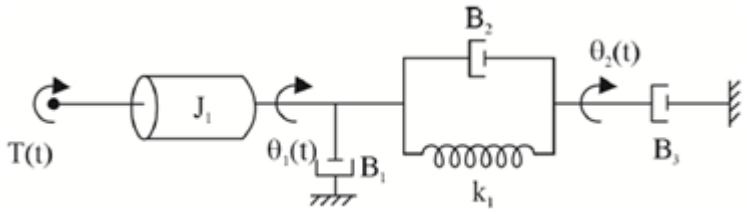


Fig. 5 (b)

OR

6.	**a.**	Find Transfer Function for the following signal flow graph shown in Fig. 6 (a).	**10**	(3 :2 : 2.1.3)

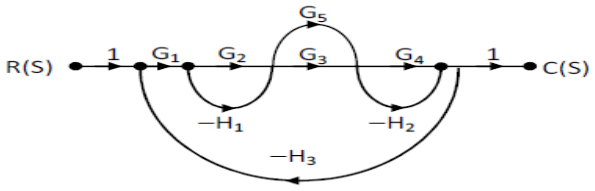


Fig. 6(a)

	b.	Define transfer function. Derive an expression for the transfer function of a closed loop negative feedback system.	**10**	(3 :2 : 2.1.3)

MODULE – 4

7.	**a.**	The characteristic equation is given by $S^4 + 2S^2 + 1 = 0$. Use RH criterion to determine (i) Number of roots in LHS of s-plane (ii) Number of roots in RHS of s-plane (iii) Number of roots on imaginary axis	**10**	(3 :4 : 2.1.3)

Note: (**RBTL - Revised Bloom's Taxonomy Level: CO - Course Outcome: PI - Performance Indicator)**

	b.	A system is given by differential equation $\frac{d^2y}{dt^2}+4\frac{dy}{dt}+8y=8$, where y is output and x is input. Determine all time domain specifications for unit step input.	**10**	(3 :4 : 2.1.3)
		OR		
8.	**a.**	For a system with characteristic equation $F(S)=S^6+3S^5+4S^4+6S^2+3S+2=0$. Examine stability	**10**	(3 :4 : 2.1.3)
	b.	Starting from the output equation C(t) derive expressions for (i) Rise time (t_r) (ii) peak overshoot (M_p) of an under damped second order system subjected to unit step input.	**10**	(3 :4 : 2.1.3)
		MODULE – 5		
9.	**a.**	Obtain the state model for the system represented by the differential equation $\frac{d^3y(t)}{dt^3}+6\frac{d^2y(t)}{dt^2}+11\frac{dy(t)}{dt}+10y(t)=3u(t).$	**10**	(3 :4 : 2.1.3)
	b.	A unity feedback system has $G(S)=\frac{K}{S(S+2)(S+10)}$. Draw Bode plot.	**10**	(3 :4 : 2.1.3)
		OR		
10.	**a.**	Obtain the state transition matrix for $A=\begin{bmatrix}0 & -1\\ 2 & -3\end{bmatrix}$	**10**	(3 :4 : 2.1.3)
	b.	Sketch the root locus for open loop transfer function $G(S)H(S)=\frac{K}{S(S+3)(S+5)}$.	**10**	(3 :4 : 2.1.3)

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