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

CLASS: BTECH **SEMESTER : V/ADD**
BRANCH: EEE **SESSION : MO/25**

SUBJECT: EE351 CONTROL 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 following: Time Invariant, Time variant, linear, nonlinear, continuous, and discrete.	[3]	1	1
Q.1(b)	Find the transfer function of a system, if its impulse response is $e^{-3t}Sin2t$.	[2]	1	2,3
Q.1(c)	Draw the signal flow graph of the system shown in Fig-1. Determine C/R for the system using Mason's gain formula.	[5]	1	2,3
Q.2(a)	Differentiate between absolute stability and relative stability.	[5]	1,3,4	2,3
	Consider a system shown in Fig. 2, with $G(s)=\frac{16}{s+0.8}$. Determine the value of k such that the damping ratio ξ is 0.5. Then obtain the rise time. Peak time, maximum overshoot and settling time in the unit step response.			
Q.2(b)	A unity feedback control system has an open-loop TF $$G(s)=\frac{K(s+1)}{s^2(s+3.6)}$$ Sketch the root locus. Also examine the stability of the system.	[5]	2,3	2,3,4
Q.3(a)	Define the following terms: Gain margin, phase margin, gain cross over frequency, phase cross over frequency.	[2]	3	1
Q. 3(b)	Sketch the polar plot for $G(s)=\frac{1}{s(s+1)}$.		2	3,4
Q.3(c)	Sketch the Bode plot for the system whose open loop transfer function is given by $G(s)H(s)=\frac{50}{s(1+0.25s)(1+0.1s)}$ .Comment on stability of the system.	[5]	2,3	2,3,4
Q.4(a)	Explain the use of following as control system components (i) Encoders (ii) potentiometers.	[3]	1	2,3
Q.4(b)	With the help of derivation, discuss the effects of (i) PD controller (ii) PI controller.	[4]	1,3.4	4,5
Q.4(c)	Explain the need for Lead compensation? Discuss the steps for designing lead compensators in time domain.	[3]	3,5	2,3,4
Q.5(a)	Outline the advantages of state variable analysis over the transfer function approach.	[2]	1	1,2
Q.5(b)	Develop the state model for the system given in Fig.3.	[3]	1	2,3
Q.5(c)	Express the following transfer function in (i) CCF form (ii) OCF form. Draw the signal flow graph. $$\frac{Y(s)}{U(s)}=\frac{3}{s^3+2s^2+3s+2}$$	[5]	1	2,3

PTO

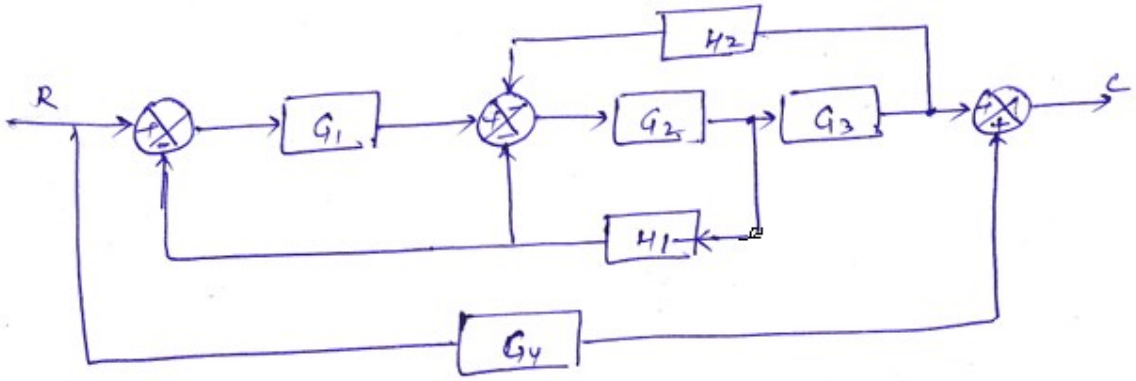

Fig - 1

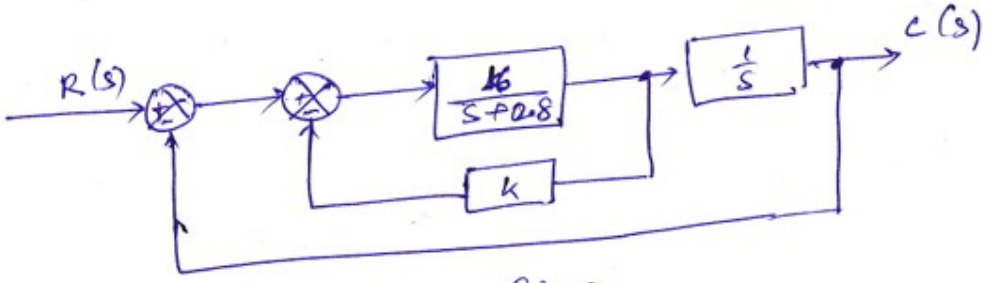

Fig - 2

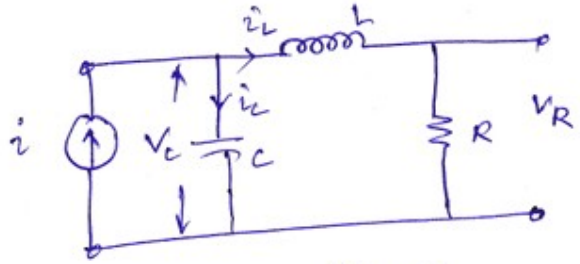

Fig - 3

::::::21/11/2025::::::M