R20 Regulation *Subject code: 3P4BD*

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

(Autonomous, Accredited by NAAC with 'A+' Grade)

B.Tech IV Semester Supplementary Examinations, July 2024

Control Systems

(EEE)

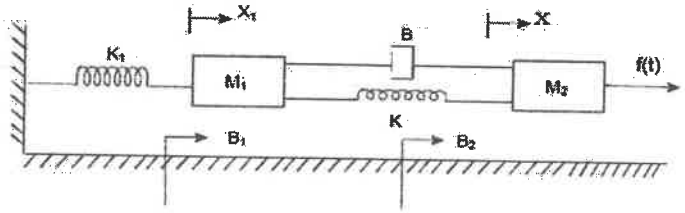
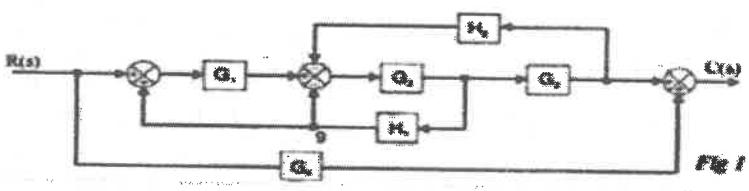
Maximum Marks: 70 Date:25.07.2024 Duration: 3 hours

Note: 1.This question paper contains two parts A and B.
2. Part A is compulsory which carries 20 marks. Answer all questions in Part A.
3. Part B consists of 5 Units. Answer any one full question from each unit which carries 10M.
4. Each question carries 10 marks and may have a, b, c, d as sub questions.

Part-A

All the following questions carry equal marks (10X2M=20 Marks)		CO	Bloom Tx
1	What is open loop system and give some examples?	1	L1
2	Write Mason's Gain Formula?	1	L1
3	What are the standard test signals used in control systems?	2	L2
4	What is an order of the system?	2	L2
5	Define absolute and conditional stability?	3	L3
6	Define root locus?	3	L3
7	State Nyquist stability Criterion?	4	L4
8	What is polar plot	4	L4
9	What are the properties of state transition matrix?	5	L5
10	Define controlability	5	L5

Part-B

Answer All the following questions. (5X10M=50Marks)			
11	Write the differential equations governing the Mechanical system shown and determine the transfer function. (10M) 	1	L3
	OR		
12	Convert the block diagram to signal flow graph and determine the transfer function  (10M)	1	L2

13	Derive the time response of second order system for under damped system for step input. (10M)	2	L4
	OR		
14	Find the steady state errors for the unit step, unit ramp and unit parabolic inputs for the system whose transfer function is (10M) $G(S) = \frac{1000(S+1)}{(S+10)(S+50)}$, H(S) =1	2	L3
15	With the help of Routh's stability criterion find the stability of the following systems represented by the characteristic equations: (10M) $s^6 + 2s^5 + 8s^4 + 12s^3 + 20s^2 + 16s + 16 = 0$.	3	L3
	OR		
16	Sketch the root locus of the system whose open loop transfer function i (10M) G(s) H(s) = **K** /[S (S^2 +4s+13] and determine the K range	3	L2
17	By Nyquist stability determine the stability of the closed loop system whose open loop transfer function is given by $G(S)H(S)=(1+S)^2/S^3$ (10M)	4	L5
	OR		
18	Explain the procedure to design the Bode plot and define the following (10M) i)gain margin ii)phase margin iii)gain cross over frequency iv) phase cross over frequency	4	L3
19	A) Explain the state variable and state transition matrix (5M) B)Derive the expression for solution of homogeneous state equations (5M)	5	L5
	OR		
20	Construct a state model for a system characterized by the differential equation $\frac{d^3y}{dt^3} + 6\frac{d^2y}{dt^2} + 11\frac{dy}{dt} + 6y + u = 0.$ Give the block diagram representation of the state model (10M)	5	L5