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

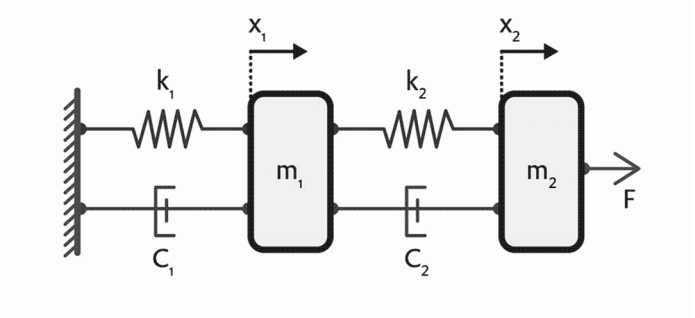
CLASS: IMSc./MSc. **SEMESTER: VIII/II**
BRANCH: PHYSICS **SESSION: SP/2023**

SUBJECT: EE601 PROCESS, MEASUREMENT AND CONTROL

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)	Derive the expression of the time-response of a second-order process subjected to a step input.	[4]	CO1	BL4
Q.1(b)	The step response of a second-order process exhibits a peak overshoot of 40% and a settling time of 4s, for 3% tolerance band. Determine the location of the poles in the s-plane and estimate the peak time of the process response.	[6]	CO1	BL3
Q.2(a)	Summarize the importance of performance indices in the tuning of PID controller. List the different performance indices and write their expression.	[5]	CO2	BL2
Q.2(b)	Explain the significance of quarter amplitude damping (QAD). Explain any one method of the Ziegler-Nichols tuning method.	[5]	CO2	BL1
Q.3(a)	Discuss the concept of stability with suitable examples. Compare the concepts of absolute and relative stability.	[4]	CO3	BL2
Q.3(b)	Apply Routh-Hurwitz criteria to test the stability of the following polynomials. Also, find how many roots of each of the below-mentioned polynomials are on the right half of the s-plane. 1) $p(s)=s^5+2s^4+3s^3+6s^2+5s+3$ 2) $p(s)=3s^5+5s^4+6s^3+3s^2+2s+1$	[6]	CO3	BL3
Q.4(a)	Describe cascade control, ratio control and selective control.	[5]	CO4	BL1
Q.4(b)	Explain Smith Predictor.	[5]	CO4	BL1
Q.5(a)	Develop the state-space model for the multivariable system shown below, where k_1, k_2 are the spring constants of the springs, C_1, C_2 are the damping coefficients of the dampers, x_1, x_2 are the positions of the bodies, m_1, m_2 are the masses and F is the applied force. Assume that both x_1 and x_2 are the outputs of the system and F is the input to the system.	[7]	CO5	BL6



Q.5(b)	Describe Relative Gain Array (RGA).	[3]	CO5	BL1

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