DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY, LONERE

Supplementary Summer Examination – 2023

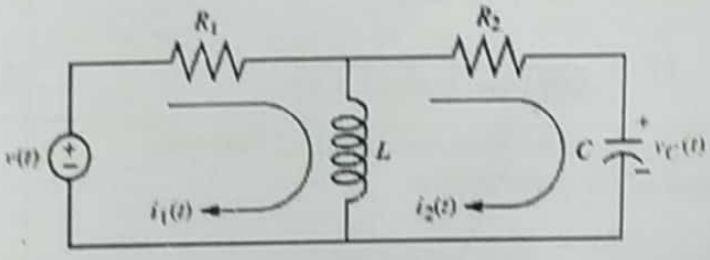
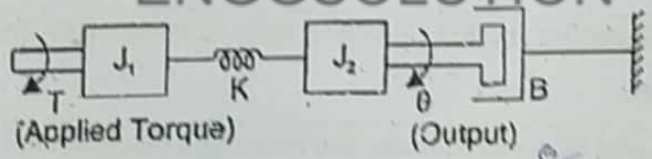
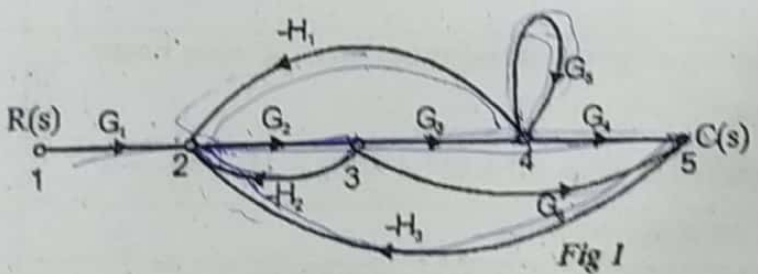
Course: B. Tech. **Branch : Electrical Engineering** **Semester : VI**

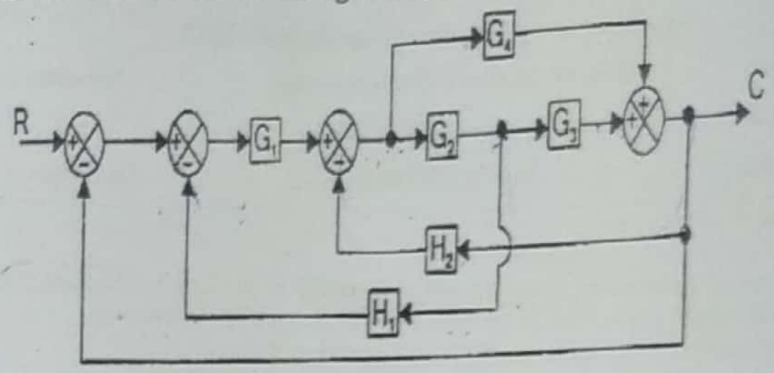
Subject Code & Name: Control System (BTEEC601)

Max Marks: 60 **Date: 13/ 07/2023** **Duration: 3 Hr.**

Instructions to the Students:

1. *All the questions are compulsory.*
2. *The level of question/expected answer as per OBE or the Course Outcome (CO) on which the question is based is mentioned in ( ) in front of the question.*
3. *Use of non-programmable scientific calculators is allowed.*
4. *Assume suitable data wherever necessary and mention it clearly.*

		(Level/ CO)	Marks
Q. 1	**Solve Any Two of the following.**		**12**
A)	Define sensitivity? Explain the effect of feedback gain on sensitivity.	**L1**	**6**
B)	Obtain transfer function $\frac{I_2(S)}{V(S)}$ of given system. 	**L2**	**6**
C)	Obtain Transfer Function of given mechanical rotational system 	**L3**	**6**
Q.2	**Solve Any Two of the following.**		**12**
A)	Determine transfer function using signal flow graph.  *Fig 1*	**L2**	**6**
B)	Explain open loop system and closed loop control system with example.	**L2**	**6**

C)	Obtain transfer function of given system. 	L2	6
Q. 3	**Solve Any Two of the following.**		12
A)	Define order and Type of the system? Explain response of first order system for unit step input.	L3	6
B)	Find the steady state error for unit step, unit ramp and unit acceleration inputs for the following systems. $TF = \frac{10}{S(0.1S+1)(0.5S+1)}$	L1	6
C)	Determine delay time, rise time, peak time, settling time and maximum overshoot of the given system $TF = \frac{10}{(S+2)(S+5)}$	L2	6
Q.4	**Solve Any Two of the following.**		12
A)	Explain PI Controller and PD Controller with its advantages and disadvantages.	L1	6
B)	Sketch bode plot of given equation and determine phase margin and gain margin. $G(S) = \frac{75(1+0.2S)}{S(S^2+16S+100)}$	L3	6
C)	Determine stability of given characteristics equation using Routh array Criterion. $Characterstics\ eq = S^4 + 8S^3 + 18S^2 + 16S + 5 = 0$	L3	6
Q. 5	**Solve Any Two of the following.**		12
A)	Sketch root locus of given open loop transfer function. $G(S) = \frac{K}{S(S^2+4S+13)}$	L3	6

B)	Derive expression for transfer function equation using state space equation formula.	L2	6
C)	Verify controllability and observability of control system which is represented in state space model. $\dot{x} = \begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \end{bmatrix} = \begin{bmatrix} -1 & -1 \\ 1 & 0 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} + \begin{bmatrix} 1 \\ 0 \end{bmatrix} [u]$ $Y = [0 \quad 1] \begin{bmatrix} x_1 \\ x_2 \end{bmatrix}$	L3	6
	*** End ***		