GUJARAT TECHNOLOGICAL UNIVERSITY
BE - SEMESTER–IV (NEW) EXAMINATION – SUMMER 2021

Subject Code:2151908   **Date:13/09/2021**

Subject Name:Control Engineering

Time:02:30 PM TO 05:00 PM   **Total Marks: 70**

Instructions:
1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**
4. **Simple and non-programmable scientific calculators are allowed.**

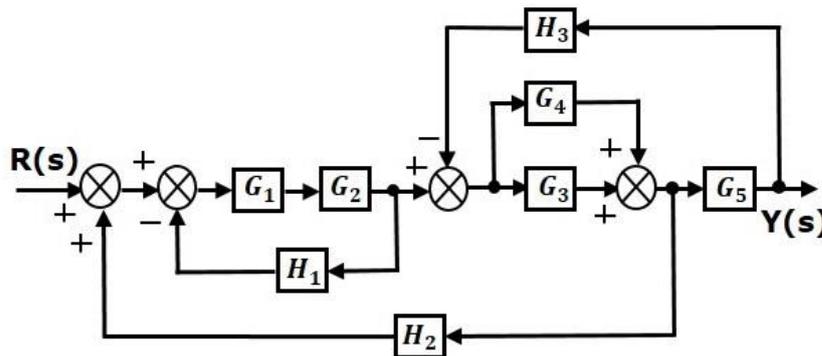|			MARKS
Q.1	**(a)**	What is open loop and close loop control system ?	03
	(b)	What are the effects of feedback on system performance? Explain	04
	(c)	Find transfer function with Block diagram reduction technique.	07

Figure : 1

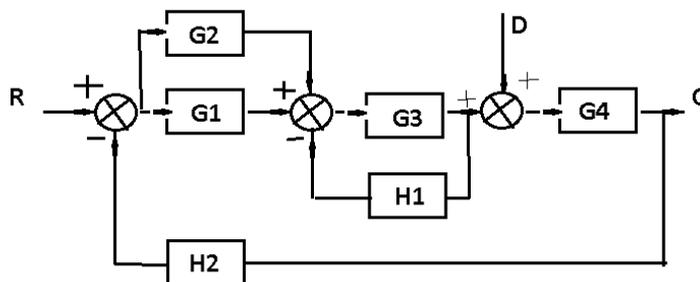|			
Q.2	**(a)**	Write the Mason's gain formula of signal flow graph.	03
	(b)	Find the value of position error constant for second order system using ramp input	04
	(c)	Determine C/R for system shown in Figure 2.	07

Figure : 2

OR

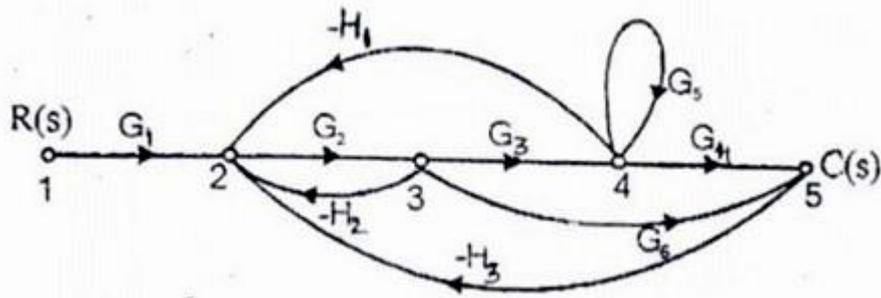|		
(c)	Solve SFG in figure 3 with Mason's Gain Formula.	07

Figure : 3

Q.3	**(a)**	Write the necessary and sufficient condition for stability in Routh's stability criterion.	**03**
	(b)	Define 'resonant frequency'.	**04**
	(c)	Derive the time response of first order system for step input.	**07**

<div align="center">OR</div>

Q.3	**(a)**	Define state and state variable.	**03**
	(b)	Explain conditionally stable system with example.	**04**
	(c)	Discuss time response of Second order control system for unit step input and also discuss effect of damping factor on time response of Second order control system.	**07**
Q.4	**(a)**	Discuss the limitation of Routh criteria.	**03**
	(b)	Using Routh criterion, check the stability of system with characteristic equation $(s^4 + 3s^3 + 6s^2 + 12 s + 8) = 0$	**04**
	(c)	Sketch the root locus of open loop transfer function of a control system is given by $G(s).H(s) = \dfrac{K(s+1)}{s^2(S+3)(s+5)}$	**07**

<div align="center">OR</div>

Q.4	**(a)**	Explain the method of finding angle of arrival from the complex pole in root locus method.	**03**
	(b)	Discuss the special cases of Routh Hurwitz criteria.	**04**
	(c)	Write the steps of finding root locus with suitable example.	**07**
Q.5	**(a)**	State advantages of frequency response analysis.	**03**
	(b)	With the help of neat diagrams, explain working of 4/3 DCV.	**04**
	(c)	Draw a neat sketch of a integral controller (Hydraulic servo motor) and derive its transfer function.	**07**

<div align="center">OR</div>

Q.5	**(a)**	Explain terms; stable system, unstable system, marginally stable system.	**03**
	(b)	With the help of necessary diagram, explain Pneumatic nozzle flapper amplifier.	**04**
	(c)	Draw the schematic diagram of Pneumatic PD controller. Explain its working and derive its transfer function.	**07**

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