

# GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER- V EXAMINATION – SUMMER 2020

**Subject Code: 2151908**

**Date: 02/11/2020**

**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.

**MARKS**

- Q.1**
- |            |  |           |
|------------|--|-----------|
| <b>(a)</b> | Define transfer function with example.                             | <b>03</b> |
| <b>(b)</b> | Distinguish open loop and closed loop control system with example. | <b>04</b> |
| <b>(c)</b> | Find transfer function with Block diagram reduction technique.     | <b>07</b> |

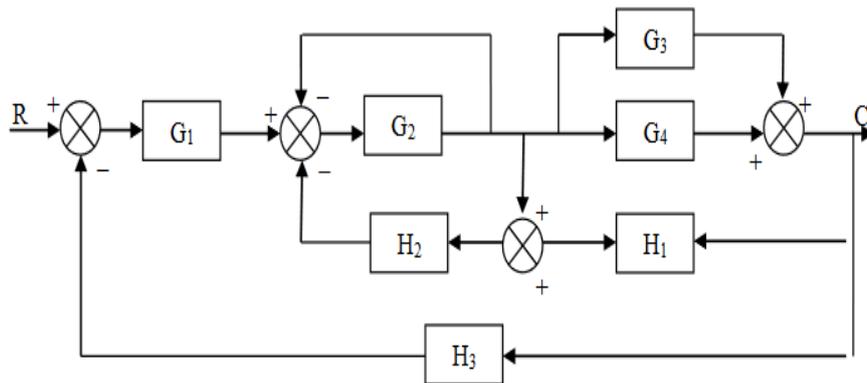


Figure : 1

- Q.2**
- |            |  |           |
|------------|--|-----------|
| <b>(a)</b> | Explain transfer function of feedback and feed forward loop. | <b>03</b> |
| <b>(b)</b> | Write note on mason's gain formula.                          | <b>04</b> |
| <b>(c)</b> | Determine C/R1 and C/R2 for system shown in Figure 2.        | <b>07</b> |

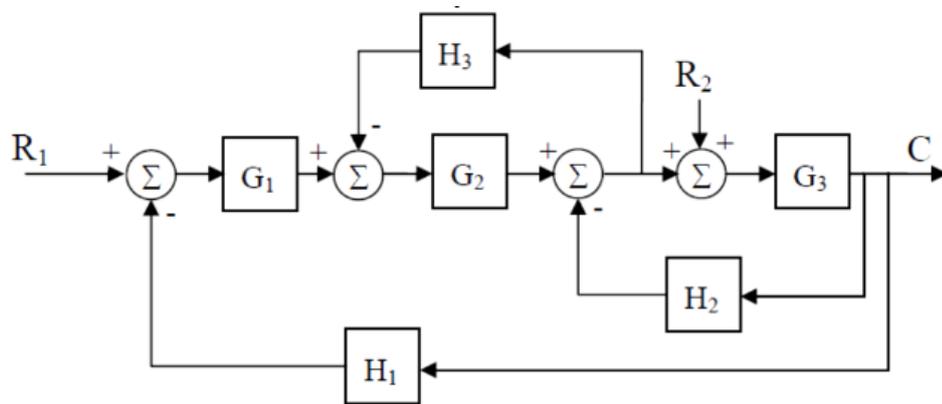
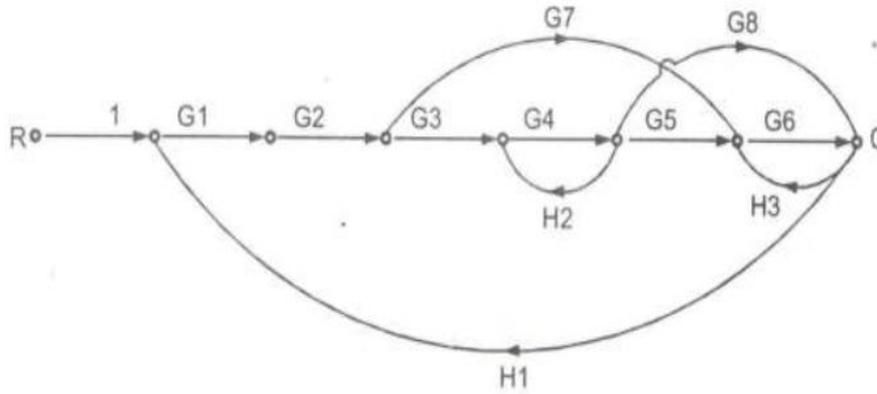


Figure : 2

**OR**

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



**Figure : 3**

- Q.3** (a) Explain disadvantages of closed loop system. **03**  
 (b) Explain Force-Voltage and Force-Current analogy. **04**  
 (c) Define following terms in context with the transient response specifications of second order system using neat sketch: Delay time, Rise time, Peak time, Maximum overshoot, settling time. **07**

**OR**

- Q.3** (a) Discuss the types of inputs with examples. **03**  
 (b) Explain the transient and steady state response of the system with neat sketch **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  $(s + 2)(s - 2)(s + j)(s - j)(s^2 + s + 1) = 0$  **04**  
 (c) Sketch the root locus of open loop transfer function of a control system is given by  $G(s). H(s) = \frac{K}{s(s+6)(s^2+4s+13)}$  **07**

**OR**

- Q.4** (a) Explain the method of finding angle of departure from the complex pole in root locus method. **03**  
 (b) Using Routh criterion, discuss about the stability for the system having characteristics equation is given as  $3s^7 + 9s^6 + 6s^5 + 4s^4 + 7s^3 + 8s^2 + 2s + 6 = 0$  **04**  
 (c) Sketch the root locus of open loop transfer function of a control system is given by  $G(s). H(s) = \frac{K(S+1)^2}{(S+2)^2}$  **07**

- Q.5** (a) State advantages of frequency response analysis. **03**  
 (b) With the help of neat diagrams, explain how the direction control valves are classified **04**  
 (c) Draw a neat sketch of a pneumatic PID controller, its block diagram and state the transfer function for the same. **07**

**OR**

- 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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