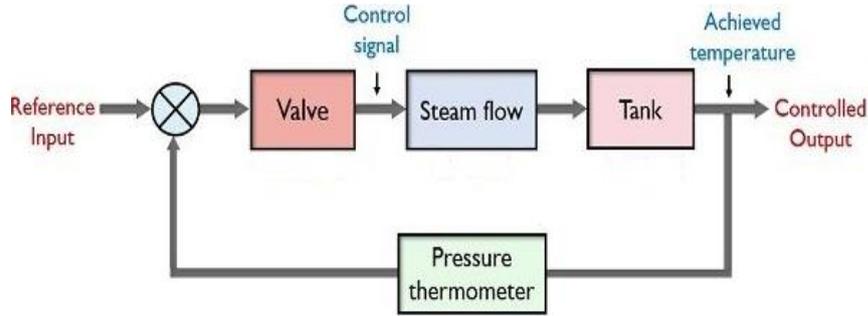


**GUJARAT TECHNOLOGICAL UNIVERSITY****Diploma Engineering – SEMESTER – 4 (NEW) – EXAMINATION – Summer-2023****Subject Code: 4341702****Date: 15-07-2023****Subject Name: Control Instrumentation System****Time: 10:30 AM to 01:00 PM****Total Marks: 70****Instructions:**

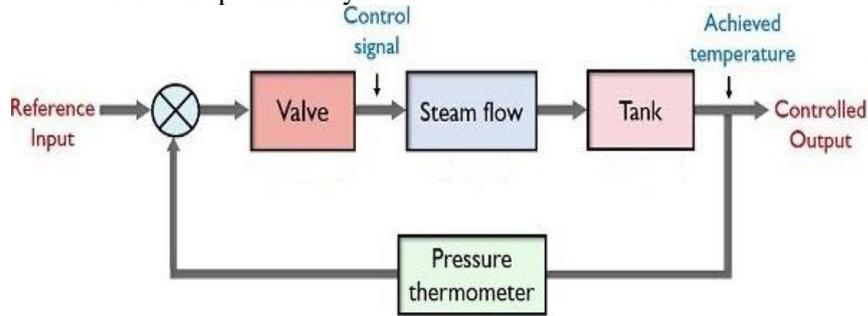
1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.
4. Use of programmable & communication aids are strictly prohibited.
5. Use of non-programmable scientific calculator is permitted.
6. English version is authentic.

**Marks**

- Q.1** (a) Explain requirement of a good control system. **03**
- પ્રશ્ન.1 (અ) Good control system ની જરૂરિયાત જણાવો. **૦૩**
- (b) Identify the blocks of given closed loop control system. **04**

**Temperature Control System**

- (બ) આપેલી closed loop control system ના બ્લોક ની ઓળખ કરો. **૦૪**

**Temperature Control System**

- (c) Describe block diagram open loop control system With example. **07**
- (ક) ઉદાહરણસહ open loop control system ના બ્લોક ડાયાગ્રામ નુ વર્ણન કરો. **૦૭**

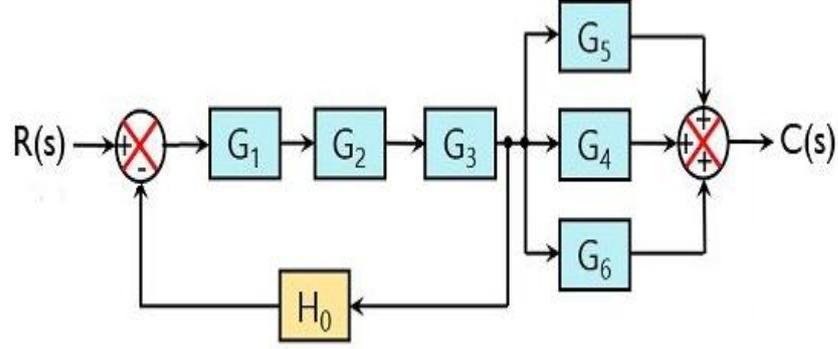
**OR**

- (c) Describe block diagram closed loop control system With example. **07**
- (ક) ઉદાહરણસહ closed loop control system ના બ્લોક ડાયાગ્રામ નુ વર્ણન કરો. **૦૭**

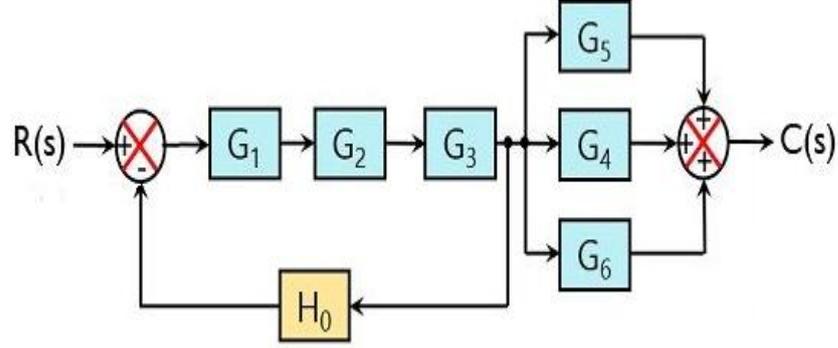
- Q.2** (a) State Mason's gain formula. **03**
- પ્રશ્ન.2 (અ) Mason's gain formula લખો. **૦૩**
- (b) Explain about procedure to determine the Transfer Function. **04**

(બ) Transfer Function શોધવાની પદ્ધતિ વિષે સમજાવો. ૦૪

(c) Obtain transfer function from given diagram using Block Diagram Reduction method. 07



(ક) Block Diagram Reduction પદ્ધતિ નો ઉપયોગ કરી આપેલી આકૃતિ માટે transfer function મેળવો. ૦૭



OR

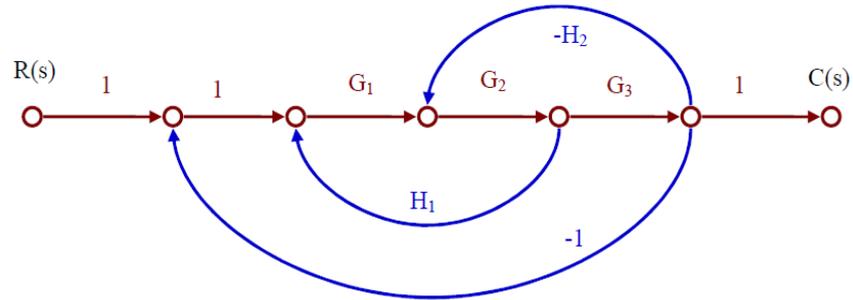
Q.2 (a) List the properties of transfer function. 03

પ્રશ્ન.2 (બ) Transfer function ના ગુણધર્મો ની યાદી બનાવો. ૦૩

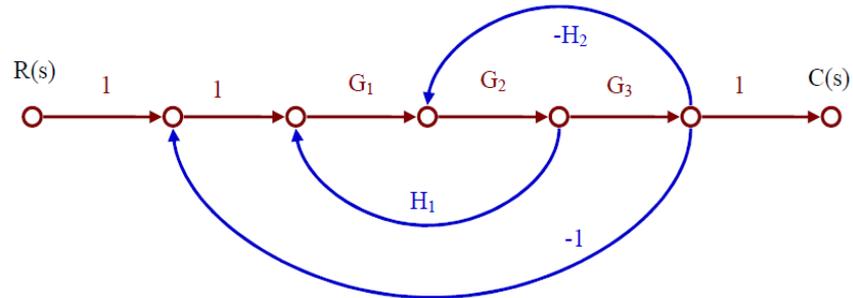
(b) Explain Force-voltage analogy with necessary diagram. 04

(બ) Force-voltage analogy જરૂરી આકૃતિ સાથે સમજાવો. ૦૪

(c) Obtain transfer function from given diagram using Signal Flow Graph method. 07



(ક) Signal Flow Graph પદ્ધતિ નો ઉપયોગ કરી આપેલી આકૃતિ માટે transfer function મેળવો. ૦૭



Q. 3 (a) Derive the equation of steady state errors for unity feedback system. 03

પ્રશ્ન.3 (બ) Unity feedback system માટે steady state errors નું સુત્ર તારવો. ૦૩

- (b) Explain standard test signal with diagram and equation. **04**  
 (બ) Standard test signal આકૃતિ અને સમીકરણ સાથે સમજાવો. **૦૪**  
 (c) Describe steady state error of control system with step input for type-0, 1, 2 systems. **07**  
 (ક) Type-0, 1, 2 systems માટે control systemને step input આપતા મળતી steady state error નું વર્ણન કરો. **૦૭**

**OR**

- Q. 3** (a) Obtain response of first order system for  $G(s)=1/sT$  **03**  
 પ્રશ્ન.3 (અ)  $G(s)=1/sT$  માટે first order system નો રીસ્પોન્સ મેળવો. **૦૩**  
 (b) Explain Order of the system and Type of the system. **04**  
 (બ) Order of the system અને Type of the system સમજાવો. **૦૪**  
 (c) Define following terms with diagram- 1) delay time  $t_d$ , 2) rise time  $t_r$ , 3) peak time  $t_p$ , 4) maximum overshoot  $M_p$ , 5) settling time  $t_s$  **07**  
 (ક) નીચે આપેલ શબ્દો ને આકૃતિ સાથે વ્યાખ્યાયિત કરો. 1) delay time  $t_d$ , 2) rise time  $t_r$ , 3) peak time  $t_p$ , 4) maximum overshoot  $M_p$ , 5) settling time  $t_s$  **૦૭**  
**Q. 4** (a) Determine the stability of control system given by characteristic equation  $s^4+ 2s^3+6s^2+4s+1 = 0$  **03**  
 પ્રશ્ન.4 (અ) આપેલ characteristic equation  $s^4+ 2s^3+6s^2+4s+1 = 0$  માટે control system ની stability શોધો. **૦૩**  
 (b) Define stability and state its types. **04**  
 (બ) Stability ને વ્યાખ્યાયિત કરો અને તેના પ્રકાર લખો. **૦૪**  
 (c) Classify the control system stability according to the location of roots of characteristic equation. **07**  
 (ક) characteristic equation ની roots ની location ને આધારે control system ની Stability નું વર્ગીકરણ કરો. **૦૭**

**OR**

- Q. 4** (a) Determine the centroid for given open loop transfer function  $G(s)H(s) = K/(s + 5)$ . **03**  
 પ્રશ્ન.4 (અ) આપેલા open loop transfer function  $G(s)H(s) = K/(s + 5)$  માટે centroid શોધો. **૦૩**  
 (b) Describe the concept of root locus in brief. **04**  
 (બ) Root locus ની concept નું ટૂંકમાં વર્ણન કરો. **૦૪**  
 (c) Explain procedure to evaluate the stability using Routh-Hurwitz criteria. **07**  
 (ક) Routh-Hurwitz criteria નો ઉપયોગ કરીને stability નું મૂલ્યાંકન કરવાની પદ્ધતિ સમજાવો. **૦૭**  
**Q.5** (a) Describe Frequency response. **03**  
 પ્રશ્ન.5 (અ) Frequency response નું વર્ણન કરો. **૦૩**  
 (b) Explain about bode plot in brief. **04**  
 (બ) Bode plot વિષે ટૂંકમાં સમજાવો. **૦૪**  
 (c) Obtain the frequency response of given transfer function using bode plot method.  $G(s)= 10/s$ . **07**  
 (ક) Bode plot method નો ઉપયોગ કરીને આપેલા transfer function માટે frequency response મેળવો.  $G(s)= 10/s$ . **૦૭**

**OR**

- Q.5** (a) Define gain margin and phase margin. **03**  
 પ્રશ્ન.5 (અ) Gain margin અને phase margin ને વ્યાખ્યાયિત કરો. **૦૩**  
 (b) Explain log scale to draw bode plot. **04**  
 (બ) Bode plot દોરવા માટે log scale ને સમજાવો. **૦૪**  
 (c) Obtain the frequency response of given transfer function using bode plot method.  $G(s) = k/s+1$ . **07**  
 (ક) Bode plot method નો ઉપયોગ કરીને આપેલા transfer function માટે frequency response મેળવો.  $G(s) = k/s+1$ . **૦૭**