

Enrolment No. _____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER-VI (NEW) EXAMINATION – WINTER 2018

Subject Code:2160104

Date:30/11/2018

Subject Name:Basic Control Theory

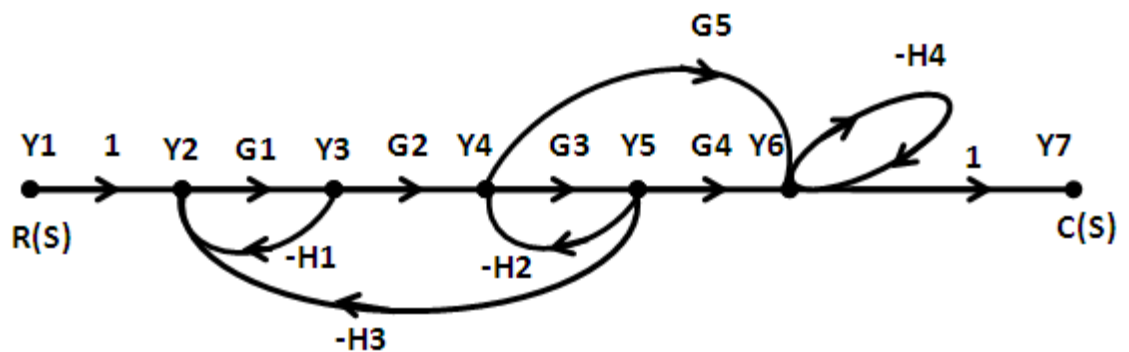
Time: 02:30 PM TO 05:00 PM

Total Marks: 70

Instructions:

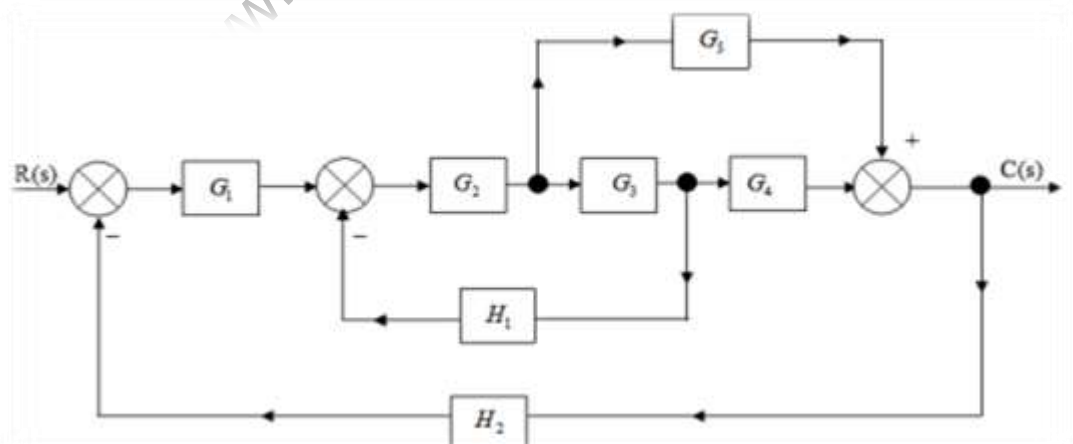
1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

- | | | |
|----------------|--|-----------|
| Q-1 (a) | Define: SISO, SIMO and MIMO System with examples. | 03 |
| (b) | What do you mean by analogous system? Explain Force to Voltage Analogy. | 04 |
| (c) | Explain Closed Loop Control System with one practical example. | 07 |
| Q-2 (a) | List rules for Block Diagram Reduction Techniques. | 03 |
| (b) | Compare Signal Flow Graph and Block Diagram Techniques. | 04 |
| (c) | Obtain the transfer function $C(s)/R(s)$ from signal flow graph of the system given below: | 07 |



OR

- (c) Find the transfer function of the system given below through block diagram reduction method: 07



- Q-3 (a)** List equation for steady state errors error constants K_p , K_i and K_d . **03**
- (b)** A unity feedback system is characterized by the open loop transfer function **04**
 $G(s) = \frac{1}{s(0.5s+1)(0.2s+1)}$. Determine the steady state errors for unit step, unit ramp and unit acceleration input.
- (c)** What is transfer function? Gives one advantage and disadvantage of its. Derive transfer function of impulse response. **07**

OR

- Q-3 (a)** Write down zeta (ζ) value for un damped, under damped, over damped and critically damped system. **03**
- (b)** The open loop transfer function of a unity feedback system is $G(S) = \frac{4}{s(s+1)}$. Determine the nature of response of the closed loop system for a unity step input signal. Also determine the rise time, peak time, peak overshoot, and settling time for 2% and 5%. **04**
- (c)** Distinguish between Conventional Control Theory and Modern Control Theory. **07**
- Q-4 (a)** By using Routh Criterion, Determine the stability of the system described by characteristics equation: $S^4 + 3S^3 + 5S^2 + 6S + 5 = 0$. **03**
- (b)** Draw the Polar Plot of $G(s) = \frac{5}{s(s+1)}$. **04**
- (c)** Draw the root locus of for the given transfer function $G(s) = \frac{k}{s(s+2)(s+5)}$. Determine the value of k . **07**

OR

- Q-4 (a)** Determine Type and Order of the system. $G(s) = \frac{10}{s(s+5)(6s+1)}$. **03**
- (b)** Write the rules for drawing root locus. **04**
- (c)** Draw the bode plot and determine the gain crossover and phase crossover frequencies for the transfer function $G(s) = \frac{12}{s(0.5s+1)(0.1s+1)}$. **07**
- Q-5 (a)** For a RL circuit, derive the state model of the system. **03**
- (b)** What is different between absolute Stability and Relative Stability? **04**
- (c)** Explain PID Controller. List Advantages, Disadvantages and Applications of it. **07**

OR

- Q-5 (a)** Explain ON OFF Controller. **03**
- (b)** Compare PI, PD and PID Controller. **04**
- (c)** Explain PI Controller. List Advantages, Disadvantages and Applications of it. **07**
