

PARUL UNIVERSITY
FACULTY OF ENGINEERING & TECHNOLOGY
B.Tech. Winter 2019 - 20 Examinations

Semester: 3
Subject Code: 203112201
Subject Name: Control Theory

Date: 29/11/2019
Time: 02:00 PM TO 04:30 PM
Total Marks: 60

Instructions:

1. All questions are compulsory.
2. Figures to the right indicate full marks.
3. Make suitable assumptions wherever necessary.
4. Start new question on new page.

Q.1 Do as directed**(15)**

- 1 The type of a control system is obtained from ----- transfer function.
 - (a) Open loop
 - (b) Closed loop
 - (c) Both open loop and closed loop
 - (d) None of above.
- 2 Transient state analysis deals with -----
 - (a) magnitude of error
 - (b) Nature of response
 - (c) both a and b
 - (d) none of the above
- 3 The optimum values of damping ratio is -----
 - (a) 0.9 to 1.1
 - (b) 0.3 to 5
 - (c) 0.3 to 0.7
 - (d) 0 to 2
- 4 If system will produce bounded response with bounded input is called _____.
 - (a) Stable system
 - (b) Unstable system
 - (c) Marginally stable system
 - (d) None of these.
- 5 Advantages of open loop system is/are
 - (a) simple & Economical
 - (b) Accurate.
 - (c) Reliable.
 - (d) All of the above.
- 6 Define pole and zero of transfer function.
- 7 Distinguish :Translational Motion and Rotational Motion.
- 8 What is Output?
- 9 Define : Block diagram
- 10 What is steady state error?
- 11 Define : Rise time.

12 What is Transfer function?

13 A unity feedback system with $G(s) = \frac{4}{s(s+2)}$ has damping ratio _____.

14 Define : Peak time.

15 Define : delay time.

Q.2 Answer the following questions. (Attempt any three) (15)

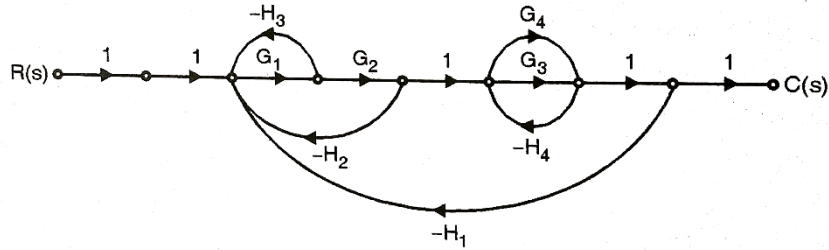
A) Derive the transfer function of close loop control system.

B) Explain standard test signals.

C) Derive the equation of steady state response for close loop control system.

D) Explain open loop and closed loop control system.

Q.3 A) Determine the transfer function $C(s)/R(s)$ for the system shown in figure using Mason's gain formula. (07)



B) Derive the expression for the unit step response of first order unity feedback control system, also draw the output response for the same. (08)

OR

B) For the system with the transfer function (08)

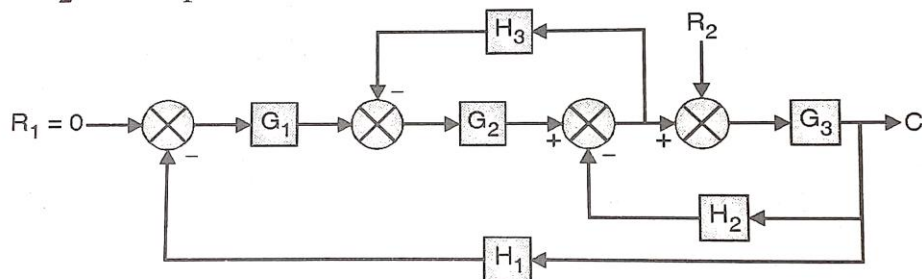
$$\frac{C(s)}{R(s)} = \frac{16}{s^2 + 1.6s + 16}$$

Find (1) rise time (2) damped frequency (3) peak time (4) maximum peak overshoot (5) settling time

Q.4 A) Determine the stability: $s^8 + 5s^6 + 2s^4 + 3s^2 + 1 = 0$ (07)

OR

A) Using the block diagram reduction techniques, evaluate the closed loop transfer function of the system as per below block diagram. (07)



B) Draw the Magnitude Bode plot of the given unity feedback system. (08)

$$G(s) = \frac{160}{(s + 2)(s + 20)}$$