Seat No: _____ Enrollment No: _____

PARUL UNIVERSITY

FACULTY OF ENGINEERING & TECHNOLOGY

B.Tech. Summer 2022 - 23 Examination

Semester: 4 **Date: 20/03/2023**
Subject Code: 203106251 **Time: 02:00 pm to 04:30 pm**
Subject Name: Control System Engineering **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 Objective Type Questions - (All are compulsory) (Each of one mark) **(15)**

01. Which of the following is an example of an open loop system?
a) Household Refrigerator b) Respiratory system of an animal
c) Stabilization of air pressure entering into the mask d) Execution of program by computer

02. The output of the feedback control system must be a function of:
a) Reference input b) Reference output
c) Output and feedback signal d) Input and feedback signal

03. Loop which do not possess any common node are said to be _____ loops.
a) Forward gain b) Touching loops
c) Non touching loops d) Feedback gain

04. Root locus of s(s+2) + K(s+4) = 0 is a circle. What are the coordinates of the center of this circle?
a) -2,0 b) -3,0
c) -4,0 d) -5,0

05. The transfer function of a system is given by $Y(s)/X(s) = e^{-0.1}s/1+s$. If x(t) is 0.5sint, then the phase angle between the output and the input will be:
a) -39.27° b) -45°
c) -50.73° d) -90°

06. Routh Hurwitz criterion cannot be applied when the characteristic equation of the system containing coefficient's which is/are _____.

07. The loop transfer function of an LTI system is G(s) H(s) = K(s+1)(s+5)/s(s+2)(s+3). For K>0, the point on the real axis that does not belong to the root locus of the system is _____.

08. For Nyquist contour, the size of radius is _____

09. A system has a single pole at origin. Its impulse response will be ____.

10. A system is said to be_____ if every state can be completely identified by measurements of the outputs at the finite time interval.

11. How can the Linear system's stability determined?

12. The output in response to a unit step input for a particular continuous control system is c(t)= 1-e-t. What is the delay time Td?

13. What is the number of the root locus segments which do not terminate on zeroes?

14. Determine the value of x if the characteristic equation is s3+14s2+(45+K)s+K =0, centroid is located at (-x,0).

15. If the gain of the open-loop system is doubled, the gain margin will be?

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

A) Explain time invariant and time varying control system.
B) Write three points about Feedback and Feedforward control system.
C) Write about Transient response and Steady state response.
D) What is Bandwidth?

Q.3 A) Obtain state model for the system whose transfer function is given as $\frac{Y(s)}{U(s)} = \frac{5S+6}{s\text{^}2+2s+3}$ **(07)**

B) The open loop transfer function of unity feedback control system is given by $G(s) = \frac{K(s+1)}{s\text{^}2}$, sketch the Root Locus.(Draw in answer sheet only.) **(08)**

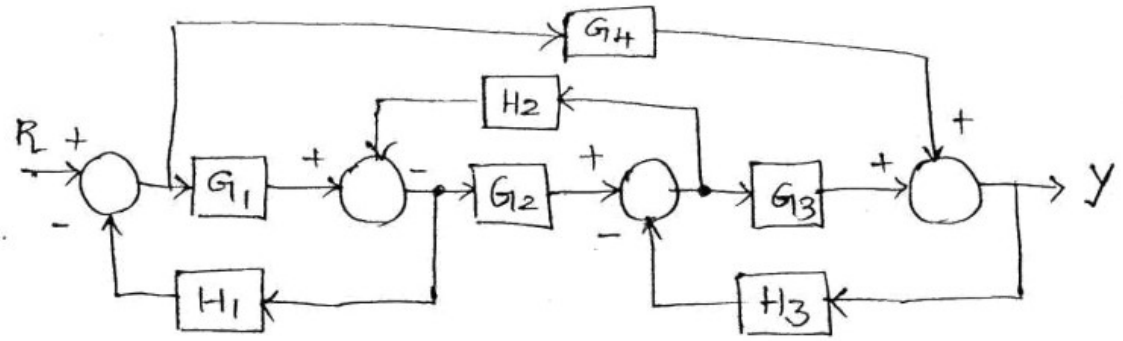
OR

B) Define (1) Gain Margin (2) Gain cross over frequency and (3) Phase margin **(08)**

Q.4 A) Define following: **(07)**
(1) Delay time (2) Rise time (3) Peak time (4) Maximum peak overshoot.

OR

A) Consider the block diagram as shown below. Draw SFG and find out transfer function. **(07)**



(08)

B) Obtain the Transfer function of the given block diagram.