

Reg No.: _____

Name: _____



APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
 Fifth semester B.Tech degree examinations (S) September 2020

Course Code: MR301

Course Name: LINEAR CONTROL SYSTEMS

Max. Marks: 100

Duration: 3 Hours

PART A

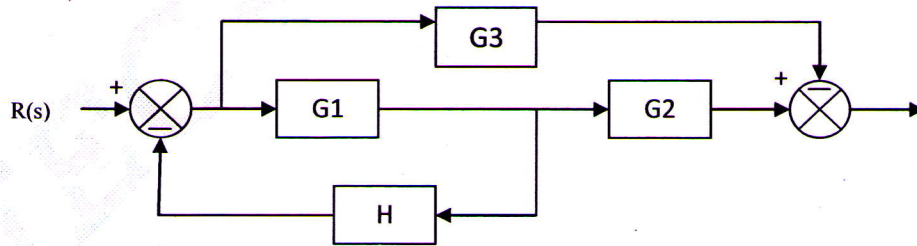
Answer all questions, each carries 5 marks.

- | | Marks |
|--|-------|
| 1 Differentiate a closed loop system from an open loop system with an example. | (5) |
| 2 Explain transient response characteristics of a damped second order system. | (5) |
| 3 State D'Alemberts's principle. Explain with an example. | (5) |
| 4 Explain the procedure for constructing root locus. | (5) |
| 5 What is transportation lag in control system? | (5) |
| 6 Explain gain margin and phase margin in frequency domain. | (5) |
| 7 What are the tuning methods in PID? | (5) |
| 8 Design a proportional integrator controller. | (5) |

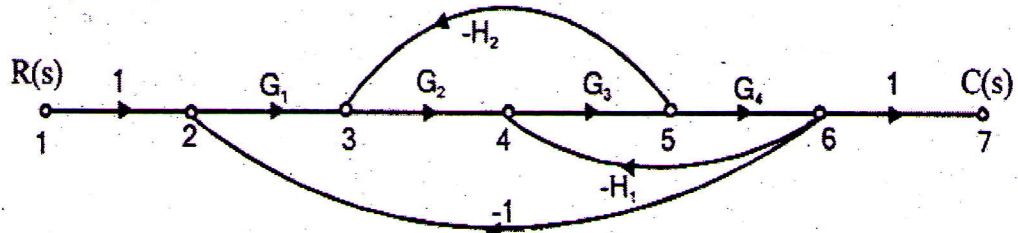
PART B

Answer any three questions, each carries 10 marks.

- 9 a) Convert the given block diagram to signal flow graph and determine $C(s)/R(s)$ (6)



- b) Determine the dynamic equation and transfer function of a RC network. (4)
- 10 Find the overall gain $C(s)/R(s)$ for the signal flow graph given below (10)



- 11 Find the transfer function of armature controlled DC motor. (10)
- 12 A unity feedback control system has an open loop transfer function (10)

$$G(s) = \frac{k}{s(s^2 + 4s + 13)}$$

sketch the root locus

- 13 State Routh stability criteria. Determine the range of k for stability of unity feedback system with transfer function (10)

$$G(s) = \frac{k}{(s+2)(s+4)(s^2 + 6s + 25)}$$

PART C

Answer any two questions, each carries 15 marks.

- 14 a) Sketch Bode diagram and obtain the gain and phase cross over frequency for the following transfer function. (15)

$$G(s) = \frac{10}{s(1 + 0.4s)(1 + 0.1s)}$$

- 15 a) The open loop transfer function of a unity feedback system is given by (15)

$$G(s) = \frac{1}{s(s+1)(2s+1)}$$

Sketch polar plot and determine the gain and phase margin.

- 16 a) Briefly explain the role of control system in mechatronics. (5)
- b) Explain automatic traffic control system and automatic street control system. (10)
- 17 a) Explain the need for cascade compensation in control system. (5)
- b) Explain PD and PID controllers with any one example. (10)
