



# ACE Engineering College

(An Autonomous Institution)

Question Paper Code:

EE404PC

ACE-R20

## Semester End Examination II B. Tech- II Semester- AUGUST/SEPTEMBER -2022 CONTROL SYSTEMS

**ELECTRICAL AND ELECTRONICS ENGINEERING**

Time: 3 Hours

Max. Marks: 70

H. T. No

*Answer any 5 Questions out of 8 Questions from the following*

Q.No	Question	Marks
1. a)	Explain the open loop & closed loop control systems.	6
b)	The signal flow graph for a feedback control system is shown in below figure. Determine the closed loop transfer function $C(s)/R(s)$ . <div style="text-align: center; margin: 10px 0;"> </div>	8
2. a)	Briefly discuss about the effects of PD and PI systems.	4
b)	A unity feedback system has a forward path transfer function $G(s) = \frac{10}{10s(s+2)}$ . Find the value of damping ratio, undamped natural frequency of the system, percentage over shoot, peak time and settling time.	10
3.	A Unity feedback control system has an open loop transfer function given by, $G(s) = \frac{K}{S(S^2 + 4S + 13)}$ Sketch the root locus.	14
4. a)	Discuss about initial and final value theorems used in time response analysis.	6
b)	Using Routh criterion, determine the stability of the system whose characteristic equation is given by $9s^5 - 20s^4 + 10s^3 - s^2 - 9s - 10 = 0$	8
5. a)	Briefly explain the concept of stability of a control system.	5
b)	Determine the overall transfer function $C(s)/R(s)$ for the system shown in below figure <div style="text-align: center; margin: 10px 0;"> </div>	9

6.	Sketch the Bode Plot for the following transfer function and obtain the gain and phase cross over frequencies. $G(s) = \frac{10}{s(1+0.4s)(1+0.1s)}$	14
7.	A unity feedback control system has an open loop transfer function given by $G(s)H(s) = \frac{10}{s(s+3)(s+6)}$ Draw Nyquist diagram and determine its stability.	14
8. a)	Explain the concept of observability and controllability.	5
b)	A linear time invariant system is represented by the state equation, $(\dot{X}) = \begin{bmatrix} 0 & 3 \\ -1 & -4 \end{bmatrix} X + \begin{bmatrix} 0 \\ 1 \end{bmatrix} U, Y = [1 \ 1] X$ . Find the characteristics equation and state transition matrix.	9