

2056
B.E. (Electrical and Electronics Engineering)
Fourth Semester
PC-EE-4402: Control Engineering - II

Time allowed: 3 Hours

Max. Marks: 50

NOTE: Attempt five questions in all, including Question No. I which is compulsory and selecting two questions from each Part. Assume any missing data.

x-x-x

1. (a) Write various factors for selection of compensators.
(b) What is dual nature of controllability and observability?
(c) Explain effect of differential gap in ON/OFF controller.
(d) Prove: $\phi(t_1 + t_2) = \phi(t_1) \cdot \phi(t_2)$
(e) Find z-transform of $\sin(\omega t)$

(5*2)

PART-A

2. (a) For the following state model:

$$\dot{x} = \begin{bmatrix} 1 & 1 & 2 \\ 0 & 2 & 1 \\ 0 & 0 & 2 \end{bmatrix} x + \begin{bmatrix} 1 \\ 1 \\ 0 \end{bmatrix} u$$

$$y = [1 \quad -1 \quad 0]x$$

Find controllability and observability.

- (b) Using observable phase variable model, find state model for:

$$T(s) = \frac{(s+1)}{s(s+4)(s+5)}$$

(5, 5)

P.T.O.

(2)

3. (a) Find transfer function for the following state model:

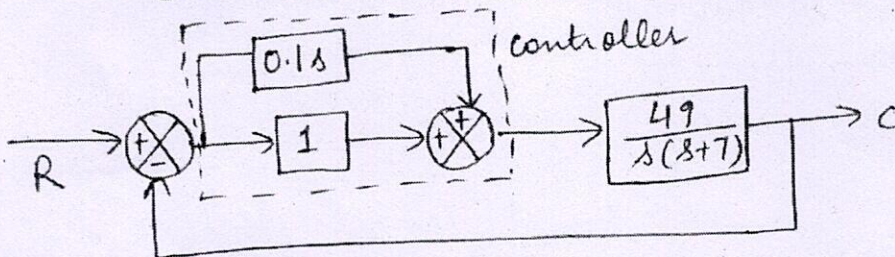
$$\dot{x} = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ -2 & -3 & -4 \end{bmatrix} x + \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix} u$$

$$y = [1 \ 0 \ 0]x + [0]u$$

- (b) Explain steps of designing of lead compensator for control system using bode plot technique.

(5, 5)

4. (a) What is meant by tuning of controllers? Explain any one method.
(b) For the following system, find damping ratio, peak overshoot and settling time when controller is connected and disconnected.



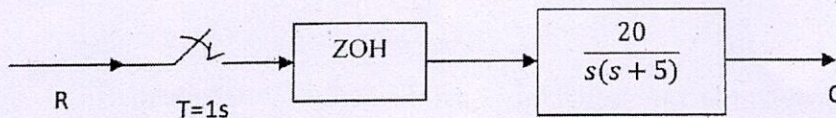
(5, 5)

PART-B

5. (a) Derive formula for transfer function of digital control system when both error and feedback sampling is present.
(b) Explain in detail, sampling process using suitable waveforms.

(5, 5)

6. Find pulse transfer function for following:



(10)

7. (a) Explain block diagram and working of digital temperature control system.
(b) Find stability using Jury's test:

$$z^3 + 3.3z^2 + 4z + 0.8 = 0$$

(5, 5)