SHAHEED BHAGAT SINGH STATE TECHNICAL CAMPUS, FEROZEPUR

ROLL No: | | | | | | | | | | | | Total number of pages: [ ]

Total number of questions: 06

B.Tech. || EE || 6th Sem

Non-Linear & Digital Control System RP

Subject Code: BTEE-603

Paper ID: 2011 - 2014 Batch

Time allowed: 3 Hrs Max Marks: 60

Important Instructions:

- All questions are compulsory

PART A (2×10)

Q. 1. Short-Answer Questions: All COs

(a) Define State and State Space.

(b) What is aliasing?

(c) What do you mean by limit cycles?

(d) Write advantages and disadvantages of digital control system.

(e) Draw the block diagram of sampled data control system.

(f) What is sampling theorem?

(g) Solve for STM $\dot{x} = \begin{bmatrix} -2 & 1 & 0 \\ 0 & -2 & 1 \\ 0 & 0 & -2 \end{bmatrix} x$

(h) What is pulse transfer function?

(i) What is initial value theorem in Z transform?

(j) Give transfer function of ZOH.

PART B (8×5)

Q. 2. a) Discuss reconstruction of sampled signal in detail. CO1

b) The state space model of a SISO system is given below

$$x(t) = Ax(t) + Bu(t), y(t) = cx(t)$$

$$A = \begin{bmatrix} 0 & 1 & 0 \\ 0 & -1 & 1 \\ 0 & -1 & -10 \end{bmatrix}; B = \begin{bmatrix} 0 \\ 0 \\ 10 \end{bmatrix} \text{ and } C = [1 \quad 0 \quad 0]$$

Determine the transfer function of the system.

OR

a) Obtain describing function of a practical relay? CO1

b) Discuss controllability and observability.

Q. 3. a) Derive the z transform of unit step function. CO4

b) Find Pulse transfer function of the given system

OR

a) Given $y(k+2)+0.4\,y(k+1)+0.1\,y(k)= -(0.5)^{(k+1)}$. find Y(z) CO4

b) Explain sampled data control system in detail.

Q. 4. a) State and prove properties of Z transform. CO1&CO4

b) Develop a state space model for a system whose dynamics is represented by the following equation

$$\frac{d^3y}{dt^3} + \frac{3d^2y}{dt^2} + 5\frac{dy}{dt} + 7y = 11x(t)$$

OR

a) Explain Pulse transfer function of a general simple sampled data control system CO1&CO4

b) Derive the transfer function from the states space model

$$x(t) = Ax(t) + Bu(t), y(t) = cx(t)$$

Q. 5. a) Consider a non-linear system described by the equation CO3

$$\dot{x}_1 = -3x_1 + x_2$$
$$\dot{x}_2 = -x_1 - x_2 - x_2^3$$

and Investigate the stability .

b) Discuss how Routh's Hurwitz criterion is applied to discrete system

OR

Discuss Jury's stability test in stability analysis. CO3

Using the same check the stability of given system

$$F(z) = 2z^4 + 7z^3 + 10z^2 + 4z + 1$$

Q. 6. a) Discuss Lyapunov;s function in detail. CO2&CO3

b) Explain Phase plane technique in detail.

OR

Short note on i) Singular points CO2&CO3

ii) Krasovskii's Method