6E6071

Roll No. _____

[Total No. of Pages : 3]

6E6071

B.Tech. VI Semester (Main & Back) Examination, April/May 2017
Electrical & Electronic Engineering
6EX1A Modern Control Theory
EE,EX

Time : 3 Hours

Maximum Marks : 80
Min. Passing Marks : 26

Instructions to Candidates:

*Attempt any **five questions**, selecting **one question** from **each unit**. All Questions carry **equal** marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing suitable be assumed and stated clearly). Units of quantities used/calculated must be stated clearly.*

Unit-I

1. a) Determine the domain of following function : (4)

$f(x)=\sqrt{4x-8}$

b) Show that the vectors are linearly dependent (4)

$\alpha_1 = [2, 3]$, $\alpha_2 = [1, 1]$, and $\alpha_3 = [4, 5]$

c) Explain in brief about time invariant system. (4)

d) Write a short note on linear and non linear system. (4)

OR

1. a) Show that the vectors $x_1 = (1, -1, -2, -4)$, $x_2 = (2, 3, -1, -1)$, $x_3 = (3, 1, 3, -2)$, and $x_4 = (6, 3, 0, -7)$ are linearly dependent. Also find relationship among them. (4)

b) Find the domain of function $f(x)=\dfrac{\sqrt{-x}}{(x-3)(x+5)}$. (4)

c) Write a short note on Relaxedness and causality of a system. (4)

d) Define domain and range of function with suitable examples. (4)

Unit-II

2. a) Construct the state model for a system characterized by the differential equation. (8)

$$\dddot{y} + 5\ddot{y} + 7\dot{y} + 9y = 8u$$

b) Express the following transfer function (Tf) in a state model

$$\frac{y(s)}{u(s)} = \frac{1}{s^3 + 6s^2 + 11s + 6}.$$ (8)

OR

2. a) Find the state model for following transfer function (Tf): (8)

$$\frac{y(s)}{u(s)} = \frac{1}{(s+1)}\frac{1}{(s+2)}\frac{1}{(s+3)}$$

b) Construct the state model in Jordan's canonical form for a system whose transfer function (Tf) is given by $\frac{y(s)}{u(s)} = \frac{10}{(s+1)^2(s+2)}$. (8)

Unit-III

3. a) Derive the ackermann's formula for the evaluation of state feedback gain. (8)

b) Find the eigen values and eigen vectors of the matrix $A = \begin{bmatrix} 1 & 2 & 0 \\ 2 & 1 & -6 \\ 2 & -2 & 3 \end{bmatrix}$. (8)

OR

3. a) A system characterized by the transfer function $\frac{y(s)}{u(s)} = \frac{2}{s^3 + 6s^2 + 11s + 6}$. Test the controllability and absorbability of the system (8)

b) Consider the state equation : (8)

$$\begin{bmatrix} \dot{x}_1(t) \\ \dot{x}_2(t) \end{bmatrix} = \begin{bmatrix} 0 & 1 \\ -2 & -3 \end{bmatrix}\begin{bmatrix} x_1(t) \\ x_2(t) \end{bmatrix} + \begin{bmatrix} 0 \\ 1 \end{bmatrix} u(t)$$

Obtain the state transition matrix.

Unit-IV

4. Find the z transform of following function : (2×8=16)

   i) $x(n) = (-1)^n u(n)$

   ii) $x(n) = (1/4)^n u[-n+3]$

OR

4. Define and prove initial and final value theorem. (16)

Unit-V

5. a) Write a short note on modeling of sample-hold circuits. (8)

   b) Write a short note on stability in z-plane. (8)

OR

5. a) Write a short note on digital PID controllers. (8)

   b) Write a short note on adaptive control system. (8)