Q.P. Code:**16EE7501** **R16**

Reg. No. | | | | | | | | | | |

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY:: PUTTUR
(AUTONOMOUS)
M.Tech I Year I Semester Regular & Supplementary Examinations February 2018
SYSTEM THEORY
(Common to CS & PE)

Time: **3 hours** Max. Marks: **60**

(Answer all Five Units **5 X 12 =60** Marks)

UNIT-I

1	a	Explain the different techniques available for obtaining state space representation of transfer function systems?	6M
	b	Construct a state model for a system characterized by the differential equation $\frac{d^3y}{dt^3} + 6\frac{d^2y}{dt^2} + 11\frac{dy}{dt}$+6y+u=0. Give block diagram representation of the state model.	6M

OR

2	a	Explain in detail about the conversion of state space model to transfer function model using fadeeva algorithm.	6M
	b	Briefly explain about the minimal realization of SISO and MIMO systems.	6M

UNIT-II

3	a	State the similarity transformation.	4M
	b	Consider a linear system described by the transfer function y(s)/u(s) = 10 / (s (s + 1) (s + 2)) Design a feedback controller with a state feedback so that the closed loop poles are placed at -2, (-1+j1) ,(-1-j1)	8M

OR

4	a	Explain the fundamental theorem of feedback control	5M
	b	State the necessary and sufficient conditions for Pole assignment by state feedback using Ackermann's formula in detail?	7M

UNIT-III

5	a	Explain the controller design using output feedback?	6M
	b	Describe the solution of algebraic Riccati equation using alternative method	6M

OR

6	a	Explain the linear quadratic regular problem	6M
	b	Derive the solution or Riccati equation using eigen values and eigen vector method.	6M

UNIT-IV

7 a Design the full order observer using ackermann's formula? 6M

b Consider the system $\dot{X} = AX + Bu,\ Y = CX$

Where $A = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ -6 & -11 & -6 \end{bmatrix}$ $B = \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix}$ $C = [1 \quad 0 \quad 0]$ 6M

Design a reduced order observer. Assume the described Eigen values for the minimum order observer are $\mu_1 = -2 + j\,2\sqrt{3}$, $\mu_2 = -2 - j\,2\sqrt{3}$.

OR

8 a Design the full order observer using Bass Gura algorithm 6M

b The state model of a system is given by 6M

$$\dot{X} = \begin{bmatrix} 0 & 0 & 1 \\ -2 & -3 & 0 \\ 0 & 2 & 3 \end{bmatrix} X + \begin{bmatrix} 0 \\ 2 \\ 0 \end{bmatrix} U; \quad Y = [1 \quad 0 \quad 0] X$$

Convert the state model into observable phase variable form

UNIT-V

9 a Explain the stability in the sense of Lyapunov. Explain about sensitivity. 6M

b Describe the method of decoupling by state feedback giving an example. 6M

OR

10 a Determine the stability of the system $\dot{X} = AX$, Where $A = \begin{bmatrix} -1 & -2 \\ 1 & -4 \end{bmatrix}$ using Lyapunov approach. 6M

b Explain the terms 'complementary sensitivity function' and 'disturbance rejection'. 6M

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