

Code No: 5243AB

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

M. Tech I Semester Examinations, February - 2017

MODERN CONTROL THEORY

(Power Electronics)

Time: 3hrs

Max.Marks:75

Note: This question paper contains two parts A and B.

Part A is compulsory which carries 25 marks. Answer all questions in Part A. Part B consists of 5 Units. Answer any one full question from each unit. Each question carries 10 marks and may have a, b, c as sub questions.

PART - A

5 × 5 Marks = 25

- Distinguish between state and state model and explain in brief. [5]
- Write the state transition matrix and its properties. [5]
- Explain about singular points. [5]
- Explain about linear continuous time invariant systems and give an example. [5]
- Explain the term constrained minimization. [5]

PART - B

5 × 10 Marks = 50

2. Explain the concept of state and non-uniqueness of state model and write state equations. [10]

OR

3. Develop the state model for a system characterized by the following differential equation $\ddot{y} + 3\dot{y} + 6y = \ddot{u} + 3\dot{u} + 8u + 4\dot{u}$ [10]

4. Define controllability and observability. write controllability and observability tests for continuous-time invariant systems. [10]

OR

5. Determine the state controllability for the system given below

$$\begin{bmatrix} \dot{x}_1(t) \\ \dot{x}_2(t) \end{bmatrix} = \begin{bmatrix} 8 & 1 \\ 0 & -4 \end{bmatrix} \begin{bmatrix} x_1(t) \\ x_2(t) \end{bmatrix} + \begin{bmatrix} -1 \\ 0 \end{bmatrix} u$$
 [10]

6. Explain the stability analysis of non-linear systems through describing functions. [10]

OR

7. Explain the method of Isoclines for constructing Trajectories. [10]

8. Find the range of value of K by applying the Liapunov's second method for the given system $\dot{x}_1 = x_2, \dot{x}_2 = -4x_2 + 2x_3, \dot{x}_3 = -Kx_1 - 2x_3$ and the given scalar function is $V(x) = 4Kx_1^2 + 3Kx_1x_2 + 8x_2^2 + 2x_2x_3 + x_3^2$ [10]

OR

9. Explain the stability analysis of linear continuous time invariant systems by Lyapunov second method. [10]

10. What are the fundamental concepts of optimal control and how to formulate the optimal control problems write in brief. [10]

OR

11. What do you mean by boundary conditions and explain about linear Quadratic regulator. [10]

---ooOoo---