

Code No: B4305/D4305

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD****M.Tech II - Semester Examinations, March/April 2011****DIGITAL CONTROL SYSTEMS****(POWER ELECTRONICS)****Time: 3hours****Max. Marks: 60**

**Answer any five questions**  
**All questions carry equal marks**

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1. a) Write the merits and demerits of digital control system.

b) Find the inverse z-transform of the following

$$\text{i. } \frac{10z}{(z-1)(z-2)} \quad \text{ii. } \frac{z}{(z-1)^2(z-2)} \quad [12]$$

2. a) Write the properties of z-transform.

b) The input output of a sampled data system is described by the difference equation

$$y(k+2)+2y(k+1)+4y(k)=r(k) \text{ determine the pulse transfer function.} \quad [12]$$

3. a) Find the state transition matrix and write its properties.

b) Determine the state controllability and observability of the system described by [12]

$$\begin{bmatrix} \frac{dx_1}{dt} \\ \frac{dx_2}{dt} \\ \frac{dx_3}{dt} \end{bmatrix} = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ -6 & -11 & -6 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} + \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix} u(t)$$

$$y = [4 \ 5 \ 1] \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix}$$

4.a) Explain stability analysis of closed loop systems in z-plane.

b) How do you explain stability using Liapunov theorem. [12]

5. Using bilinear transformation explain the design procedure of lag and lead Compensators. [12]

6. Explain the root locus rules of a digital system in detail with an example. [12]

7. a) Determine the possible discrete state variable representation for the pulse transfer function as shown below:

$$\frac{y(z)}{u(z)} = \frac{1 + 6z^{-1} + 8z^{-2}}{1 + 4z^{-1} + 8z^{-2}}$$

b) Write the merits of PID controllers [12]

8. Write short notes on the following

i) Primary strips ii) Kalman filters iii) Introduction to adaptive controls [12]

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