PVP 12

Code: **EEPC2T5A**

I M.Tech-II Semester-Regular Examinations-August 2014

DIGITAL CONTROL SYSTEMS

(POWER SYSTEM CONTROL AND AUTOMATION)

Duration: 3 hours Marks: 5x14=70

Answer any FIVE questions. All questions carry equal marks

1 a) What are the different types of sampling operations? Explain each of them. 5 M

b) What do you mean by the problem of aliasing? How to overcome this? 5 M

c) Explain the advantages and disadvantages of digital control systems. 4 M

2 a) Explain the properties of Z-transforms? 7 M

b) Find the inverse z-transform of the following functions: 7 M

i) $F(z)=\dfrac{2z+1}{(z-0.1)^2}$ ii) $F(z)=\dfrac{2z}{z^2-1.2z+0.5}$

iii) $F(z)=\dfrac{10z}{z^2-1}$ iv) $F(z)=\dfrac{1}{z(z-0.2)}$

3 a) State and explain the Liapunov's stability theorem for linear digital systems. 7 M

b) Given $X(k+1) = \begin{bmatrix} 0.5 & 1 \\ -1 & -1 \end{bmatrix} X(k)$

Solve for 'P' - matrix and justify, by using the Liapunov's theorem (Direct method). Show that the system is asymptotically stable. 7 M

4 a) Explain briefly the stability analysis of a digital system using Routh-Hurwitz stability analysis. 7 M

b) Test the stability of the following polynomial using Jury's stability test

$F(z) = z^5 + 2.6\,z^4 + 0.3z^3 - 1.2z^2 + 25 = 0$ 7 M

5 a) Construct a state model for a system characterized by the differential equation. 7 M

b) What are the advantages and disadvantages of state space analysis? 7 M

6 a) Find the state transition matrix for the given state equation 7 M

$$X(k+1) = F\,X(k) + Gu(k),$$

Where

$$F = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 1 & 0 \\ 0 & -0.5 & 1.5 \end{bmatrix};\ G = \begin{bmatrix} 0 & 1 \\ 1 & 0 \\ 2 & 1 \end{bmatrix}$$

b) Explain the method of computing the state transition matrix? 7 M

7 Solve the following difference equations by Z-transform Method

a) $x(k+2) = x(k+1) + x(k)$, given that $x(0) = 0$ and $x(1) = 1$ 7 M

b) $x(k+2) + 3x(k+1) + 2x(k) = 0$, with $x(0) = 0$ and $x(1) = 1$ 7 M

8 Write a short notes on the following:

a) Least upper bound on Quantization Error 7 M

b) TMS 320 Digital Signal Processor 7 M