PVP 12

Code: **EEPC2T5A**

I M.Tech - II Semester - Regular Examinations - December 2013

DIGITAL CONTROL SYSTEMS
(POWER SYSTEM CONTROL & AUTOMATION)

Duration: 3 hours Marks: 5x14=70

Answer any FIVE questions. All questions carry equal marks

1. a) With help of schematic diagram explain the principle operation of digital to analog conversion. 5 M

   b) Explain the conditions to be satisfied for reconstruction of sampled signal into continuous signal. 5 M

   c) Explain zero order hold device. 4 M

2. a) State and prove the following properties/theorems of z-transforms.
      i. Shifting theorem
      ii. Complex translation theorem
      iii. Complex differentiation and Partial differentiation theorem 7 M

   b) Solve the following difference equation

$$2\,y(k) - 2\,y(k-1) + y(k-2) = r(k)$$

$$y(k) = 0 \quad \text{for } k<0 \quad \text{and}$$

$$r(k) = \begin{cases} 1; & k = 0,1,2 \\ 0; & k<0 \end{cases}$$

   7 M

3. a) State and explain Jury's stability test. 7 M

b) Using Jury's stability criterion find the range of K, for which the characteristic equation

$$z^3 + Kz^2 + 1.5\,Kz - (K+1) = 0$$

is closed loop stable. 7 M

4. a) Explain Obtain a state space representation of the following digital transfer function using the partial fraction expansion method.

$$Y(z)/R(z) = (1+6Z^{-1}+8Z^{-2})/(1+Z^{-1}+2Z^{-2})$$

Hence obtain a state transition matrix. 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) Clearly explain the limitations of the classical control method. Define state, state variables and state space. 7 M

b) Develop the state model of linear system and draw the block diagram of State model. 7 M

6. a) Define controllability and observability. Explain both of them with the help of Kalman's test. 7 M

b) State the duality between controllability and observability? 7 M

7. Sketch the root locus of a digital system indicating all the component information on the root loci, given

$$G(z)=\frac{K(z^2+0.5z+0.2)}{(z-1)(z^2-z+0.5)}$$

14 M

8. Write a short notes on the following:
   a) Least upper bound on Quantization Error
   b) TMS 320 Digital Signal Processor 14 M