Code No: **R42021** **R10** **Set No. 1**

IV B.Tech II Semester Supplementary Examinations, July/August - 2017

DIGITAL CONTROL SYSTEMS

(Electrical and Electronics Engineering)

Time: 3 hours **Max. Marks: 75**

Answer any FIVE Questions
All Questions carry equal marks
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1 a) Define continuous and discrete time signals with neat schematics? [6]

b) Find whether the following signals are periodic or not

(i) $3\cos\left(17\pi t+\frac{\pi}{3}\right)+2\sin\left(19\pi t-\frac{\pi}{3}\right)$

(ii) $u(t)-u(t-10)$

(iii) $\cos\left(\frac{1}{3}t\right)+\sin\left(\frac{1}{4}t\right)$ [6]

c) Define linear time invariant system with example. [3]

2 a) Obtain the Z-transform of the following

(i) $X(S)=\frac{a}{s^2(s+a)}$ (ii) $X(S)=\frac{s}{(s^2-\omega^2)}$ [8]

b) Find the Z-Transform of the following

(i) $F(S)=\frac{1}{s^2(s+1)}$ (ii) $f(t)=t\sin(\omega t)$ [7]

3 a) Explain the any two examples of data control systems. [8]

b) Discuss about the sample and hold operations. [7]

4 a) A discrete – time system is described by the difference equation.

$$Y(K+2)+5Y(K+1)+6Y(K)=u(K)$$

$$Y(0)=Y(1)=0;T=1Sec.$$

Determine a state model in canonical form. [8]

b) Explain the methods for computation of state transition matrix? [7]

5 a) Derive the relation between controllability, observability and transfer function. [8]

b) Examine whether the discrete data system given below.

$$X(K+1)=\begin{bmatrix}0 & 1\\ -3 & -4\end{bmatrix}X(K)+\begin{bmatrix}1\\ -1\end{bmatrix}u(K)$$

$$Y(K)=\begin{bmatrix}1 & 0\end{bmatrix}X(K)$$

Is (i) State controllable (ii) Output controllable [7]

6 a) Explain the following
(i) Constant frequency loci (ii) Constant damping loci [8]

b) State and explain Jury stability test applied to discrete time controls. [7]

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7 a) Explain the design procedure of lead-lag compensator in W-plane. [8]
b) Explain the design procedure in the ω-plane of lag compensator. [7]

8 Write short notes on the following:
a) Ackerman's formula
b) Necessary conditions for pole placement [15]