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

IV B.Tech II Semester Supplementary Examinations, April/May - 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) Explain the following with neat sketches [5]
(i) Time shifting (ii) Amplitude scaling
b) Check whether the following systems are causal or not
(i) $y(n) = x(n) + \frac{1}{x(n-1)}$ (ii) $y(t) = x^2(t) + x(t-2)$ [5]
c) Whether the following signals are periodic or not [5]
(i) $x(t) = 2\cos(10t+1) - \sin(4t-1)$ (ii) $2u(t) + 2sin\pi t$

2 a) Obtain the inverse Z-Transform of $X(z) = \frac{Z(Z+2)}{(Z-1)^2}$ by using residues method [8]
b) Define the z-transform? What is the motivation for using z-transform in the study of digital systems? [7]

3 a) Explain the examples data control system? [8]
b) State and explain the sampling theorem? [7]

4 a) Using Z-transform method find the state transition matrix for the digital system is given by. $X(K+1) = \begin{bmatrix} 0 & 1 \\ -3 & -4 \end{bmatrix} X(K)$ [8]
b) Consider the following system [7]

$$\frac{y(z)}{u(z)} = \frac{z+1}{z^2 + 1.3z + 0.4}$$

Write (i) Controllable canonical form
(ii) Diagonal form

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5 a) State observability conditions for pulse transfer functions? [8]

b) Examine whether the discrete data system given below. [7]

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

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

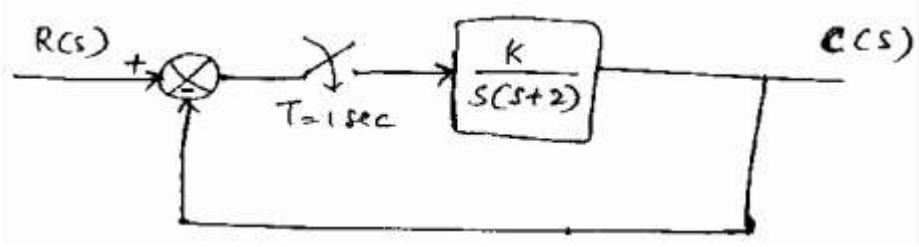
Is (i) State controllable (ii) output Observable

6 a) Explain the following [8]

(i) Primary strips and complementary strips

(ii) Constant damping ratio loci

b) Find the range of K for the system shown in figure. 1 to be stable using Jury stability test.



[7]

Figure. 1

7 Write short note on following [15]

(a) Lead lag compensators

(b) Transient response specifications

8 a) Write the Ackerman's formula? [7]

b) Discuss the necessary conditions for design of state feedback controller through pole placement? [8]