

Total No. of Questions : 6]

SEAT No. :

P36

[Total No. of Pages : 2

APR-17/B.E./Insem. - 40**B.E. (Electrical)****DIGITAL CONTROL SYSTEMS****(2012 Pattern) (Elective - III (c))****Time : 1 Hour]****[Max. Marks : 30****Instructions to the candidates:**

- 1) Attempt Q1 or Q2, Q3 or Q4, Q5 or Q6.
- 2) Neat diagrams wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Use of logarithmic tables, electronic pocket calculator is allowed.
- 5) Assume suitable data, if necessary

Q1) a) Check whether the following systems are [5]

- i) Static or Dynamic
 - ii) Linear or non-Linear
 - iii) Time invariant or Time variant
- 1) $Y(n) = e^{x(n)}$ 2) $Y(n) = x(2n)$

b) Explain frequency domain characteristics of first order hold. [5]**OR****Q2) a) For a given sequence: $x(n) = \{4, 3, 0, 1, 2\}$ [5]**

- ↑
- i) Delay the sequence by 3 samples.
 - ii) Fold & advance the sequence by 2 samples.
 - iii) Downscale the sequence by time 2 samples.
 - iv) Up-scale the sequence by amplitude scales.
 - v) Carry out amplitude downscaling.

b) Explain with neat diagram the various standard discrete test signals used in digital control system. [5]**Q3) a) Show how a mapping of left half of the S-plane is done into the Z-plane. [5]****b) Examine the stability of the system by Bilinear transformation method, whose characteristics equation is**

$$F(z) = z^3 - 1.3z^2 - 0.08z + 0.24 = 0$$

[5]**OR****P.T.O.**

- Q4)** a) Explain Bilinear Transformation & its use in stability investigation of discrete time system. [5]
- b) Describe design procedure of digital lead compensator using bode plot for discrete time system. [5]

- Q5)** a) Derive the solution of a non-Homogeneous state equation of a discrete time system from first Principles. [5]
- b) Using Cayley-Hamilton Theorem obtain the state transition matrix of the discrete time system. [5]

$$x(k+1) = \begin{pmatrix} 1 & -1 \\ 0 & 2 \end{pmatrix} x(k), \text{ Take } x(0) = \begin{pmatrix} 1 \\ -1 \end{pmatrix}$$

OR

- Q6)** a) Consider the system defined by [5]

$$\frac{Y(z)}{U(z)} = \frac{3z^2 - 11z}{z^3 - 6z^2 + 11z - 6}$$

Determine State space representation in Controllable canonical form.

- b) Discuss the various methods used for STM. [5]

▽ ▽ ▽ ▽