Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

ME - SEMESTER– II(Old course) • EXAMINATION (Remedial) – WINTER- 2015

Subject Code: 1720702 **Date: 10/12/2015**

Subject Name: Digital Signal Processing

Time:2:30 pm to 5:00 pm **Total Marks: 70**

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

Q.1 **(a)** Sketch a discrete time signal $x(n) = 2^{-n}$ for -2Òn Ò2 and obtain **07**

(i) $y_1(n) = 2x(n) + ŭ(n)$; (ii) $y_2(n) = x(n) \cdot u(2-n)$

(b) Explain the given systems with respects to following properties: Dynamicity, Time invariance , Linearity, Causality, Stability. **07**

(i) $y(n) = \sum_{\kappa=-\infty}^{n} x(\kappa)$; (ii) $y(n) = \text{sgn}[x(n)]$

Q.2 **(a)** Describe four important discrete time sequence (e.g. unit sample seq etc.) analytically **07**

(b) Determine whether or not each of the following systems is shift-invariant : **07**

(i) $y(n) = x(n) + x(n-1) + x(n-2)$

(ii) $y(n) = x(n^2)$

OR

(b) Given the sequence $x(n) = (6-n)[u(n) - u(n-6)]$ make the sketch of **07**

(i) $y_1(n) = x(4-n)$; (ii) $y_2(n) = x(2n-3)$

Q.3 **(a)** Given that x(n) is the system input and y(n) is the system output, which of the following system are causal ? **07**

(i) $y(n) = x^2(n)u(n)$; (ii) $y(n) = x(|n|)$; (iii) $y(n) = x(n)$ ï $x(n^2-n)$

(b) Explain the region of convergence in Z-transform and prove following properties of Z-transform. (i) Time shifting property (ii) Frequency shifting property **07**

OR

Q.3 **(a)** Determine the Z- transform and ROC of finite duration signal **07**

$$x(n) = \{2, 4, 5, 7, 0, 1\}$$
$$\uparrow$$

(b) Find x(n) for the given x(z) **07**

$$X(Z) = \frac{10Z}{(Z \quad 1)(z \quad 2)}$$

Q.4 **(a)** Explain the Direct form Realization of FIR & IIR Digital Filter. **07**

(b) Obtain the direct form I and II of a system described by **07**

$$y(n) \text{ ï } 3/4\, y(n-1) + 1/8\, y(n-2) = x(n) + 1/2\, x(n-1)$$

OR

Q.4 **(a)** Compute Linear convolution of the following **07**

$$x(n) = \{1, 1, 1, 1\} \text{ and } h(n) = \{1, 1, 1, 1\}$$
$$\uparrow \qquad\qquad \uparrow$$

(b) Consider a casual LSI system function **07**

$$H(Z) = \frac{1 - a^{-1}Z^{-1}}{(1 - az^{-1})}$$

Where óaô is real. Determine the value of óaô for which the system is stable. Show graphically for 0<a<1 ; poleï zero and the ROC.

Q.5 **(a)** Explain the application of DSP in image processing **07**

(b) Explain architecture of General Purpose Digital Signal Processor. **07**

OR

Q.5 **(a)** Explain the Harvard architecture for DSP processor with appropriate diagram. **07**

(b) Explain architecture of Special Purpose Digital Signal Processor.(e.g. PWM) **07**

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