

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 $-2m \leq n \leq 2m$ and obtain **07**

(i) $y_1(n) = 2x(n) + x(n)$; (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) $y(n) = x(n) \circ x(n^2-n)$

(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**

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

↑

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

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

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**

$$y(n) \circ 3/4 y(n-1) + 1/8 y(n-2) = x(n) + 1/2 x(n-1)$$

OR

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

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

↑

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- (b) Consider a casual LSI system function 07

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

Where a is real. Determine the value of a for which the system is stable. Show graphically for $0 < a < 1$; pole-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
