

GUJARAT TECHNOLOGICAL UNIVERSITY
M. E. - SEMESTER – I • EXAMINATION – WINTER • 2013

Subject code: 710422**Date: 01-01-2014****Subject Name: Digital Signal Processing and Application****Time: 10.30 am – 01.00 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) (i) Determine Linearity of following systems. **07**
 $(1) Y(n)=\cos(x(n)). \quad (2) y(n)=a^{x(n)}$
(ii) Determine following systems are time variant or invariant.
 $(1) \text{Folded System.} \quad (2) y(n)=x(n^2)$
(iii) Determine following system are causal or non-causal
 $(1) \text{Ideal Delay system.} \quad (2) y(n)=x(n)+5x(n+3). \quad (3) y(n)=x^2(n)$
- (b) Define Following terms: **07**
 $(1) \text{Static \& dynamic} \quad (2) \text{causal \& non causal}$
 $(3) \text{linear \& nonlinear} \quad (4) \text{stable \& non stable}$
- Q.2** (a) Determine linear convolution of the given sequences **07**
 $X_1(n)=\{1,2,1,1\}, X_2(n)=\{1,-1,2\}$ using Graphical Method.
- (b) Write the Property Of Z-transform and prove any three. **07**
- OR**
- (b) Find out the convolution between $X_1(n)=\{1,2,2,1\}, X_2(n)=\{1,-1,2\}$ using **07**
tabulation method
- Q.3** (a) Determine the Inverse Z-transform using long division method Of **07**

$$X(z)=\frac{1}{1-\frac{3}{2}z^{-1}+\frac{1}{2}z^{-2}}$$
when (a) ROC: $|Z|<1$ (b) ROC: $|Z|<\frac{1}{2}$
- (b) (i) Distinguish between DFT and DTFT **07**
(ii) Compare linear and circular convolution.
- OR**
- Q.3** (a) Determine the Z-transform **07**

$$x(Z)=\frac{1+\frac{1}{2}z^{-1}}{1-\frac{1}{2}z^{-1}}$$
- (b) Given the two sequences of length $x(n)=\{0,1,2,3\}, h(n)=\{2,1,1,2\}$ compute **07**
the circular convolution.
- Q.4** (a) Discuss direct form I realization of IIR filter with necessary diagrams. **07**
(b) Differentiate between DIT & DIF. Draw Decimation in Frequency FFT **07**
algorithm for $N=4$ (take suitable data).
- OR**
- Q.4** (a) Discuss direct form Structure of FIR Digital Filter with necessary diagrams. **07**
(b) Write Application of FFT algorithm. Draw DIT FFT flow graph for **07**
 $x(n)=\{1,2,3,4\}$

- Q.5** (a) Describe windowing methods for FIR filters with necessary mathematical steps. **07**
- (b) List various application areas of DSP processors and describe application of DSP to speech processing. **07**

OR

- Q.5** (a) Compare Floating point Vs Fix point dsp processor. **07**
- (b) Explain finite word length effects in FIRdigital filters. **07**
