

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) Static & dynamic (2) causal & non causal

(3) linear & nonlinear (4) stable & non stable

Q.2 (a) Determine linear convolution of the given sequences 07

$$X_1(n)=\{1,2,1,1\}, X_2(n)=\{1,-1,2\} \text{ using Graphical Method.}$$

(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 tabulation method 07****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 the circular convolution. 07**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 algorithm for $N=4$ (take suitable data). 07****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 $x(n)=\{1,2,3,4\}$ 07**

- | | | | |
|------------|------------|--------------------------------------------------------------------------------------------------------|-----------|
| 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 |

~~*~*~*~*