B.E.(with Credits)-Regular-Semester 2012 - Information Technology Sem VI IT603 - Digital Signal Processing

P. P Tim	ages : ie : Thi	2 ree Hours $* 3 5 5 2 *$	GUG/W/16/5382 Max. Marks : 80
	Note	 Same answer book must be used for all questions. All questions carry as indicated marks. Due credit will be given to neatness and adequate dimensions. Assume suitable data wherever necessary. Illustrate your answers wherever necessary with the help of neat 	sketches.
1.	a)	A discrete time signal x(n) is defined as $x(n) = \begin{cases} 1 + \frac{n}{4} & -4 \le n \le -1 \\ 1 & 0 \le n \le 4 \\ 0 & \text{elsewhere} \end{cases}$ a) Determine and sketch signal x(n) b) Sketch signal results if we: 1) First fold x [n] and delay resulting signal by four sample. 2) First delay x [n] by four sample and then fold.	8
	b)	Determine whether the following system are : i) Causal or non-causal ii) Linear or non-linear iii) Time variant or invariant iv) Stable or unstable v) $y(n) = cos [x(n)]$	8
		OR	
2.	a)	Perform convolution sum using mathematical equation of convolution Given: $h(n) = \{1, 2, 1, -1\}$ & $x(n) = \{1, 2, 3, 1\}$	8
	b)	 Explain the following system properties with example. i) Static system. ii) Time variant system iii) Causal system iv) Linear system 	8
3.	a)	State and prove convolution property of DFT.	8
	b)	Compute 4-point DFT of $x(n) = \{0, 1, 3, 5\}$	8
		OR	
4.	a)	Find the IDFT of following sequence $x(k) = \{6, -2+2j, -2, -2-2j\}$	8
	b)	State and explain 'Time reversal of sequence property" of DFT and Prove	it. 8

5. a) Find inverse z-transform of $x(z) = \frac{1}{1 - 1.5z^{-1} + 0.5z^{-2}}$

- if i) ROC: |z| > 1ii) ROC: |z| < 0.5iii) ROC: $0.5 \le |z| < 1$
- b) Find the z-transform and its ROC of

i)
$$x(n) = \left(\frac{-1}{5}\right)^n u(n) + 5\left(\frac{1}{2}\right)^{-n} u(-n-1)$$

Find z-transform of $n^2 - 2n + 3$ for $n \ge 0$.

ii) $x(n) = n \cdot a^n u(n)$

6.

a)

OR

- b) Find inverse z-transform by using partial fraction expansion method. $x(z) = \frac{7 - 18z^{-1} + 6z^{-2}}{\left[1 - 0.5z^{-1}\right] \left[1 - 3z^{-1}\right]}$
- **7.** a) What is Bilinear transformation? Explain obtain on expression for bilinear transformation. **8**
 - b) What is linear phase filter? What conditions are to be satisfied by impulse response of FIR **8** system in order to have linear phase?

OR

8.	a)	Realize the following using cascade and parallel form of FIR filter:	8
		$H(z) = \frac{3 + 3.6z^{-1} + 0.6z^{-2}}{1 - 2}$	
		$1 + 0.1 z^{-1} - 0.2 z^{-2}$	

b) Draw direct form implementation of FIR system having difference equation y(n) = x(n) - 2x(n-1) + 3x(n-2) - 10x(n-6)

9. a) Prove that
$$\sum_{n=0}^{N-1} |x(n)|^2 = \frac{1}{N} \sum_{k=0}^{N-1} |x(k)|^2$$

where x(n) and x(k) are DFT pairs.

b) Obtain 8 point DFT of the signal $x(n) = \{1, 2, 3, 2, 1, 2, 3, 2\}$ using Radix 2 8 decimation in time F. F.T. Algorithm.

OR

10. Find circular convolution of the signal $x_1(n) = \{ 0, 1, 2, 3 \}$ and $x_2(n) = \{ 2, 1, 2, 1 \}$ using D. F. T. and IDFT method.

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