GUJARAT TECHNOLOGICAL UNIVERSITY B. E. - SEMESTER – VII • EXAMINATION – WINTER 2012

Subject code: 171003 Date: 01/01/2				
Time	Time: 10.30 am - 01.00 pm Total Marks: 70			
111511	1. 2. 3.	Attempt any five questions. Make suitable assumptions wherever necessary. Figures to the right indicate full marks.		
Q.1	(a)	Define the following with respect to discrete time systems: (i) Linear Shift Variant System (ii) Recursive system (iii)Stable System(iv) Causal system	04	
	(b)	Find the Z Transform of :	06	
		(i) $x(n) = \left(\frac{1}{4}\right)^n u(n) - \left(\frac{1}{2}\right)^n u(n-1)$		
		(ii) $x(n) = \left(\frac{1}{3}\right) u(n-1)$		
		(iii) $x(n) = r^n (\cos \omega_0 n) u(n)$	0.4	
	U	Check for the shift invariance and stability of an accumulator	04	
Q.2	(a)	Justify the following statements with respect to discrete time systems. (any $\underline{\text{TWO}}$)	04	
		(i)An impulse input to an accumulator yields a unit step output (ii) For a causal LTL system impulse response $h(n)=0$ for $n < 0$		
		(iii) The convolution operation satisfies the commutative property.		
	(b)	 Define Z transform . Explain the following properties of Z transform: (i) Multiplication of an exponential Sequence (ii) Differentiation of X(Z) 	05	
		(II) Differentiation of X(Z) OR		
	(b)	Prove $Z[x_1(n) * x_2(n)] = X_1(Z) + X_2(Z)$	05	
		Prove $F[nx(n)] = j \frac{dX(e^{j\omega})}{d(\omega)}$		
	(c)	Define region of Convergence of Z transform. Explain right sided and left sided discrete time sequences and discuss the region of convergence with suitable illustrations and sketches.	05	
Q.3	(a)	Explain the Concept of Sampling and alising in Sampled data System	03	
	(b)	Explain the symmetry property of the Fourier Transform for real, real-odd	04	
	(b)	Find $y(n)$ using linear Convolution property of Z transform	07	
	()	for $x(n) = \{2,1,0,0,5\}$, $h(n) = \{2,2,1,1\}$ Also verify by the graphical method		
Q.3	(a)	List the applications of DSP	02	
-	(b)	Explain the design of IIR filter using Bilinear transformation method and discuss its advantages over other design methods Discuss the stability aspects and frequency warping	06	
	(c)	Determine the inverse Z transform of the following:	06	

(i)
$$X(z) = \frac{(1+3z^{-1})}{(1+3Z^{-1}+2Z^{-2})}$$

(Long Division Method) for x(n) causal and x(n)

anticausal

(ii)
$$X(z) = \frac{(5z^{-1})}{(1-2Z^{-1})(3-2Z^{-1})}$$
 (Partial Fraction Method)

Q.4	(a) (b)	Explain the window functions used in FIR filter design. Obtain the system function $H(Z)$ for the system described by the difference equation,	04 08
		y(n) - 3y(n-1) + 2y(n-2) = x(n) - x(n-1)	
		Realize the filter using (i) Direct Form I (ii) Direct Form II (iii)Cascade form (iv) Parallel Form for all cases, draw the structures neatly with system equations at different points.	
	(c)	Determine the frequency spectrum of the signal	02
		$\mathbf{x}(\mathbf{n}) = \left(\frac{1}{3}\right)^n u(n-5)$	
		OR	
Q.4	(a)	Compute the circular convolution of the sequences	06
		$x_1 = \{1, 2, 2, 1\}$ and $x_2 = \{1, 2, 3, 1\}$ showing the steps in detail	
	(b)	Discuss two properties of DFT.	04
	(c)	Find the IDFT of $Y(K) = \{1, 0, 1, 0\}$	04
Q.5	(a)	Define (i)DTFT(ii)DFT and (iii)IDFT of a discrete time sequence with	03
	(b)	Find 4 point DET of $y(n)$ and $h(n)$ for the given sequences	07
	(0)	$x(n) = \{2, 0, 0, 1\}$ and $h(n) = \{4, 3, 2, 1\}$ Compute $Y(K) = X(K) H(K)$	07
	(c)	Find the DFT of the sequence $x(n) = \{1, 0, 0, 1\}$ using DIF algorithm	04
	(-)	OR	-
Q.5	(a)	Compute the 8 point DFT of the sequence	08
		$x(n) = \{1,1,1,1,1,1,1,1\}$ using DIT FFT and draw the flow diagram. Compute	
		the values at the output of all stages and indicate them in the table.	
	(b)	Explain any <u>one</u> of the following:	06
		(i)Decimation in frequency FFT algorithms	
		(11) Architecture of DSP Processor (iii) Immulae Invertice as mothed for UD filter design	
		(III) Impulse invariance method for IIK filter design.	
