



B.E DEGREE EXAMINATIONS: NOV/DEC 2014

(Regulation 2009)

Sixth Semester

ELECTRONICS AND INSTRUMENTATION ENGINEERING

EIE112: Digital Signal Processing

Time: Three Hours

Maximum Marks: 100

Answer all the Questions:-

PART A (10 x 1 = 10 Marks)

1.	A signal of maximum frequency 10 KHz is sampled at Nyquist rate. The time interval between 2 successive samples is			
	a)	50 μ s	b)	100 μ s
	c)	1000 μ s	d)	5 μ s
2.	A system is said to be a causal if its output at anytime depends upon			
	a)	Future inputs only	b)	present inputs only
	c)	Present and Future inputs	d)	Present and previous inputs
3.	The Z transform of $\delta(n - m)$ is			
	a)	z^{-n}	b)	z^{-m}
	c)	z^{-mn}	d)	1
4.	ROC of the z-transform of unit step sequence is			
	a)	$ Z = 1$	b)	$ Z > 1$
			c)	Entire Z
			d)	$ Z < 1$
5.	Determine the convolution of two sequences $x(n) = \{3, 2, 1, 2\}$ and $h(n) = \{1, 2, 1, 2\}$			
	a)	$y(n) = \{3, 8, 8, 12, 9, 4, 4\}$	b)	$y(n) = \{3, 8, 3, 12, 9, 4, 4\}$
	c)	$y(n) = \{3, 8, 8, 12, 9, 1, 4\}$	d)	$y(n) = \{3, 8, 8, 1, 9, 4, 4\}$
6.	The number of complex multiplications required for computing the FFT of a 64- point sequence is			
	a)	64	b)	32
			c)	192
			d)	128
7.	The necessary and sufficient condition for a FIR filter to have linear phase.			
	a)	$h(n) \geq \pm h(N-1-n); 0 \leq n \leq N-1$	b)	$h(n) < \pm h(N-1-n); 0 \leq n \leq N-1$
	c)	$h(n) \geq \pm h(N-1-n); 0 \leq n \leq N-1$	d)	$h(n) = \pm h(N-1-n); 0 \leq n \leq N-1$

8.	The bilinear transformation equation between s plane and z plane is			
	a)	one - one mapped	b)	one - many mapped
	c)	many- one mapped	d)	many – many mapped
9.	What is MAC?			
	a)	Multitasking Accumulator	b)	Multiplier Accumulator
	c)	Multiprocessing Accumulator	d)	Multitasking & multiprocessing Accumulator
10. is the MATLAB command for computing the linear connection.			
	a)	conv	b)	con
	c)	convolution	d)	cc

PART B (10 x 2 = 20 Marks)

11.	Determine if the system $y(n) = nx^2(n)$ is (1) Linear (2) Time invariant.			
12.	Draw continuous time unit step and unit impulse.			
13.	Find the Z-transform & ROC of $x(n) = u(n) - u(n-2)$.			
14.	Find the z transform of $-u(-n-1)$.			
15.	The first five DFT coefficients of a 8 – point sequence $x(n)$ are $X(0)=20$, $X(1)=5+2j$, $X(2)=0$, $X(3)=0.2+0.4j$, $X(4)=0$. Determine the remaining DFT coefficients.			
16.	Merits of DIT and DIF.			
17.	Distinguish between IIR and FIR filters			
18.	What is bilinear transformation?			
19.	What are the addressing modes available in TMS320C5X processors?			
20.	If a sum of 256 products is to be computed using a pipelined MAC unit, and if the MAC execution time of the unit is 100nsec, what will be the total time required to complete the operation?			

PART C (5 x 14 = 70 Marks)

21.	a)	Discuss the classification of DT and CT signals with examples.		
(OR)				
	b)	(i)	Describe sampling process in detail. Use schematics as necessary.	(7)
		(ii)	Obtain an expression for quantization error.	(7)
22.	a)	(i)	Compute The Z-transform of $x(n) = \sin(\omega_0 n).u(n) + \cos(\omega_0 n).u(n)$	

		(ii)	Compute The Z-transform of $x(n) = -n\alpha^n u(-n-1)$.	
(OR)				
	b)	(i)	Determine the z transform of $x_1(n) = \alpha^n u(n)$ and $x_2(n) = -\alpha^n u(-n-1)$ and indicate their regions of convergence.	
		(ii)	Determine $x(n)$ if $X(z) = \frac{z+2}{2z^2-7z+3}$ if the ROCs are (i) $ z > 3$ (ii) $ z < 1/2$ (iii) $1/2 < z < 3$	
(OR)				
23.	a)	(i)	Determine the 8-point DFT of $x(n) = \{1,1,1,1,1,1,1,0\}$ using DIT-FFT algorithm.	
		(ii)	Compute the circular convolution of the sequences. $a(n) = \{1,1,2,2\}$ and $b(n) = \{1,2,3,4\}$.	
(OR)				
	b)	(i)	Determine the IDFT of $X(k) = \{28, -4+j9.656, -4+j4, -4+j1.656, -4, -4-j1.656, -4-j4, -4-j9.656\}$ using DIT-FFT algorithm.	
		(ii)	Compute the output of linear filter described by $h(n) = \{1,2,3,2,1\}$ and input $x(n) = \{1,1,1,1\}$.	
(OR)				
24.	a)		Design an ideal high pass filter using Hanning window with $N=11$. $H_d(e^{j\omega}) = \begin{cases} 1 & -0.25\pi \leq \omega \leq 0.25\pi \\ 0 & 0.25\pi \leq \omega \leq \pi \end{cases}$	
(OR)				
	b)		Transform an analog filter with the transfer function $H_a(s) = \frac{0.5(s+4)}{(s+1)(s+2)}$ into a digital filter using impulse - invariant technique.	
(OR)				
25.	a)		Explain the architecture and important features of Digital Signal Processor TMS320C54XX.	
(OR)				
	b)		Describe how the DFT and FFT can be implemented using MATLAB.	
