## **GUJARAT TECHNOLOGICAL UNIVERSITY**

**BE - SEMESTER-VII (NEW) EXAMINATION - WINTER 2018** 

Subject Code: 2170914 Date: 15/11/2018

**Subject Name: Digital Signal Processing** 

Time: 10:30 AM TO 01:00 PM Total Marks: 70

**Instructions:** 

1. Attempt all questions.

Q.4 (a) Define DFT.

- 2. Make suitable assumptions wherever necessary.
- 3. Figures to the right indicate full marks.

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Q.1	(a)	A discrete –time signal $x(n)$ is given below: $X(n) = \{1,2,1,-2,1,2,3,4,14\}$	MARKS 03	
	(b)	Sketch and label carefully each of the following signals: (i) x(n-2) (ii) x(-4-n) (iii) x(n/2) List advantages of Digital Signal Processing over Analog Signal Processing.	04	
	(c)	Find the linear convolution of following pairs of discrete sequences	07	
		$ \begin{array}{ll} \text{(i)} \ \ x_1(n) = \{1,2,3,4,12,4,6\} & \ \ h_1(n) = \{4,3,2,1\} \\ \text{(ii)} \ \ x_1(n) = \{1,2,1,2,1,2,1\} & \ \ \ h_1(n) = \{1,2,3,4,3,2,1\} \\ \end{array} $		
Q.2	(a) (	Obtain Fourier transform of single sided exponential pulse $x(n) = a^n u(n)$	03	
	<b>(b)</b>	Check the following systems for time invariance and	04	
	(c)	Linearity: (i) $y(n) = n[x(n)]^2$ (ii) $y(n) = a[x(n)]^2 + b x(n)$ Calculate DTFT of following signals (i) $x(n) = [\frac{1}{4}, \frac{1}{4}, \frac{1}{4}, \frac{1}{4}]$ (ii) $x(n) = 2(\frac{3}{4})^n u(n)$	07	
	(c)	Explain Inverse system, minimum phase system and all pass system. Determine Inverse of the system characterized by $y(n)=0.5y(n-1)+x(n)$ assuming zero initial conditions.	07	
Q.3	(a)	Find the Z Transform of u(n-1)	03	
	<b>(b)</b>	The impulse response of the LTI system is $h(n)=\{2,4,5,6\}$ .	04	
		Determine the response of the system to the input signal $x(n)=\{1,1,2,3\}$		
	(c)	Determine the inverse z-transform of the function $X(Z) = \begin{bmatrix} 1 & 1 & 1 \\ 1 & 1 & 1 \end{bmatrix}$ , $ Z  > 1$	07	
03	(a)	OR Find Z-transform of $x(n) = [2(4)^n - 4(2)^n] u(n)$	03	
Q.3	(a) (b)	State and prove the differentiation property of Z transform.	03 04	
	(c)	Determine the response of the system,	07	
	(-)	y(n) = y(n-1) - y(n-2) + x(n)  to the input	•	
		signals. $x(n) = \delta(n) - \delta(n-1)$		
		organia. A(II) V(II)		

03

	<b>(b)</b>	Find the IDFT of $Y(K) = \{1,0,1,0\}$	04
	(c)	Explain 8-point DFT from two 4 point DFTs using radix-2	07
	` /	Decimation in frequency (DIF) FFT algorithm.	
		OR	
Q.4	(a)	Find the Circular convolution of following pairs of discrete	03
<b>C</b>	()	sequences	
		(i) $x_1(n) = \{3,2,3,4\}$ $x_2(n) = \{1,3,1,3,2,1\}$	
		↑ ↑ ↑	
	<b>(b)</b>	Obtain the value of X(4) for 8 point DFT if	04
	(2)	$x(n) = \{1,-1,0,2,1,-2,-1,1\}$	•
		$A(n) = \{1, 1, 0, 2, 1, 2, 1, 1\}$	
	(c)	Derive DIT FFT flow graph for $N = 4$ hence find DFT of	07
	(0)	$x(n) = \{1, 2, 3, 4\}$	07
Q.5	(a)	Write a note on windowing.	03
	<b>(b)</b>	Determine $H(Z)$ by using impulse invariant method if $H(s) =$	04
	(,-)	and sampling time is 0.01 sec.	-
	<b>(c)</b>	Obtain Direct Form I & II realization of a system described	07
		by	
		y(n) - 1/6 y(n-1) + 1/3 y(n-2) = x(n) + 2x(n-2)	
		OR	
Q.5	(a)	Compare Decimation in Time and Decimation in Frequency.	03
	<b>(b)</b>	Explain Floating point Digital signal processors.	04
	(c)	With the help of a neat sketch, explain Digital Signal	07
	Proc	cessor architecture.	

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