Seat No.: Enrolment No.

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

			MARKS
Q.1	**(a)**	A discrete –time signal x(n) is given below : X(n) = {1,2,1,-2,1,2,3,4,14} ↑ Sketch and label carefully each of the following signals: (i) x(n-2) (ii) x(-4-n) (iii) x(n/2)	**03**
	(b)	List advantages of Digital Signal Processing over Analog Signal Processing.	**04**
	(c)	Find the linear convolution of following pairs of discrete sequences (i) $x_1(n)$ = {1,2,3,4,12,4,6} $h_1(n)$ = {4,3,2,1} (ii) $x_1(n)$ = {1,2,1,2,1,2,1} $h_1(n)$ = {1,2,3,4,3,2,1}	**07**
Q.2	**(a)**	Obtain Fourier transform of single sided exponential pulse $x(n) = a^n u(n)$	**03**
	(b)	Check the following systems for time invariance and Linearity : (i) $y(n) = n[x(n)]^2$ (ii) $y(n) = a[x(n)]^2 + b\,x(n)$	**04**
	(c)	Calculate DTFT of following signals (i) x(n) = [¼ ,¼, ¼, ¼] (ii) $x(n) = 2(\frac{3}{4})^n u(n)$	**07**
		OR	
	(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 $\left(\frac{1}{3}\right)^{n-1} u(n-1)$	**03**
	(b)	The impulse response of the LTI system is h(n)={2,4,5,6}. ↑ Determine the response of the system to the input signal x(n)={1,1,2,3} ↑	**04**
	(c)	Determine the inverse z-transform of the function $X(Z) = \frac{1}{(1-1.5\,z^{-1}+0.5\,z^{-2})}$, $\lvert Z\rvert > 1$	**07**
		OR	
Q.3	**(a)**	Find Z-transform of $x(n) = [2(4)^n - 4(2)^n]\,u(n)$	**03**
	(b)	State and prove the differentiation property of Z transform.	**04**
	(c)	Determine the response of the system, $y(n) = \frac{5}{6}y(n-1) - \frac{1}{8}y(n-2) + x(n)$ to the input signals. $x(n) = \frac{1}{3}\delta(n) - \delta(n-1)$	**07**
Q.4	**(a)**	Define DFT.	**03**

(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 Decimation in frequency (DIF) FFT algorithm. **07**

OR

Q.4 **(a)** Find the Circular convolution of following pairs of discrete sequences **03**

(i) $x_1(n) = \{3,2,3,4\}$ $x_2(n) = \{1,3,1,3,2,1\}$

↑ ↑

(b) Obtain the value of X(4) for 8 point DFT if **04**
x(n) = {1,-1,0,2,1,-2,-1,1}

(c) Derive DIT FFT flow graph for N = 4 hence find DFT of **07**
x(n) = {1, 2, 3, 4}

Q.5 **(a)** Write a note on windowing. **03**

(b) Determine H(Z) by using impulse invariant method if H(s) = $\frac{10}{s+2}$ and sampling time is 0.01 sec. **04**

(c) Obtain Direct Form I & II realization of a system described by **07**
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) Explain Floating point Digital signal processors. **04**

(c) With the help of a neat sketch, explain Digital Signal Processor architecture. **07**

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