GUJARAT TECHNOLOGICAL UNIVERSITY
PDDC - SEMESTER–VI • EXAMINATION – SUMMER • 2014

Subject Code: X 61103   **Date: 03-06-2014**
Subject Name: Digital Signal Processing
Time: 10:30 am - 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.**

Q.1	**(a)**	Draw the basic block diagram of digital signal processing. Also classify the signals and systems with suitable illustrations.	**07**
	(b)	Define the z transform. Enlist the properties of ROC for z transform with necessary illustration.	**07**
Q.2	**(a)**	State and Prove the time shifting and convolution property of z transform.	**07**
	(b)	Check the following system for time invariance and linearity	**07**

1) $y(n) = n[x(n)]^2$ **2)** $y(n) = x(n) \cos(n\pi/4)$

OR

	(b)	State the sampling theorem and Define the nyquist rate. What is the Nyquist rate for signal $x(t) = 3 \cos(50\pi t) + 10 \sin(300\pi t) - \cos(100\pi t)$?	**07**
Q.3	**(a)**	Enlist the properties of Fourier Transform. Determine and sketch the frequency spectrum for $x_1(n) = a^n u(n)$ and $x_2(n) = \delta(n-5)$.	**07**
	(b)	Solve the followings:	**07**

1) Obtain the z transform for $x(n) = a^n u(n)$ and $h(n) = -a^n u(-n-1)$ indicate ROC.
2) Determine the system function and the unit sample response of the system
   described by the difference equation: $y(n) = (1/2) y(n-1) + 2 x(n)$

OR

Q.3	**(a)**	Define DTFT. Using DTFT find the impulse response of a LTI system describe by the difference equation: $y(n) - (1/2) y(n-1) = x(n) - (1/4) x(n-1)$.	**07**
	(b)	Solve the followings:	**07**

1) Determine the inverse z transform of $X(z) = 1/(1 - 1.5z^{-1} + 0.5z^{-2})$ for all
   Possible sequences.
2) Determine the signal $x(n)$ for $X(z) = 1/(1 - a z^{-1})$ for $z < a$ using power
   series expansion.

Q.4	**(a)**	For the given system $H(z) = (1 + 0.25z^{-1}) / [(1 + 0.5z^{-1})(1 + 0.5 z^{-1} + 0.25z^{-2})]$. Draw the cascade and parallel form of realizations.	**07**
	(b)	Explain IIR filter design by bilinear transformation method.	**07**

OR

Q.4	**(a)**	Write a brief note on decimation in time FFT algorithm.	**07**
	(b)	Define circular and linear convolution. For given two sequences $x(n)=\{0,1,3,3,2\}$ and $h(n)=\{1,2,1,2,3\}$ find the linear and circular convolution.	**07**
Q.5	**(a)**	Find 4 point DFT of given $x(n) = \cos(n\pi/2)$ using DIF FFT algorithm.	**07**
	(b)	Explain Goertzel Algorithm in brief.	**07**

OR

Q.5	**(a)**	With the help of block diagram explain architecture of TMS320C6XXX processor.	**07**
	(b)	Compare FIR and IIR Filters.	**07**

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