GUJARAT TECHNOLOGICAL UNIVERSITY BE - SEMESTER-VII(NEW) • EXAMINATION - WINTER 2016

Subject Code:2171708 Subject Name: Digital Signal Processing Time: 10.30 AM to 1.00 PM

Date:21/11/2016

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)	What are the basic elements of Digital Signal Processing of the system? State advantages of Digital over analog signal processing.	07
	(b)	(1) Two signals $x_1(t)=\cos 20\pi t$ and $x_2(t)=\cos 100\pi t$ are sampled with sampling frequency 40 Hz. Obtain the associated discrete time signals $x_1(1)$ and $x_2(n)$ and comment on the result. (2) For the analog signal $x_a(t)=3\cos 50\pi t +10\sin 300\pi t -\cos 100\pi t$. Calculate the	07
		Nyquist rate.	
Q.2	(a)	Perform the circular convolution of the two sequences $x_1(n) = \{2,1,2,1\}$ and $x_2(n) = \{1,2,3,4\}$	07
	(b)	Determine the impulse response $h(n)$ for the system described by the second-order difference equation $y(n)-3y(n-1)-4y(n-2)=x(n)+2x(n-1)$	07
		OR	
	(b)	Develop direct form I realization of IIR filter having transfer function, $H(z) = \frac{5 - 3z^{-1} + 2z^{-2}}{1 - 2z^{-1} + 2z^{-2}}$	07
		$1 - 0.5z^{-1} + 0.55z^{-2}$	
Q.3	(a)	For a given discrete time systems, check whether they are: (1) Static or dynamic (2) Linear or non-linear (3) Shift invariant or shift-varying (4) Causal or non-causal (5) Stable or unstable. Explain with reasons: (i) x(n)u(n) (ii) x(n)+nx(n+1) (iii) x(-n)	14
OR			
Q.3	(a)	The impulse response of a linear time-invariant system is $h(n)=\{1,2,1,-1\}$	14
		Determine the response of the system to the input signal using convolution with graphical method. $x(n)=\{1,2,3,1\}$	

(a) Determine the z-transform of the signal: $x(n)=a^n(\cos\omega_0 n)u(n)$ 07 **O.4** (b) Explain bilinear transformation method for FIR filter design. 07

OR

(a) Determine the z-transform of the signal (1) $x(n) = na^n u(n)$ (2) $x(n) = -a^n u(-n-1)$ **Q.4** 07 (b) Determine the inverse z-transform of 07 $X(z) = 1/1 - 1.5z^{-1} + 0.5z^{-2}$ if (a) ROC: |z| > 1 and (b) ROC: 0.5 < |z| < 1 using partial fraction expansion.

Q.5 (a)Explain Radix-2 Decimation in Time algorithm.07(b)Determine the response of FIR filter using DFT if:
$$x(n)=\{1,2\}$$
 and $h(n)=\{2,2\}$ 07

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- Q.5 (a) Determine the sequence y(n) using four-point DFT for impulse response 07 $h(n)=\{1,2,3\}$ and input sequence $x(n)=\{1,2,2,1\}$
 - (b) Explain symmetry properties of DFT.

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