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Total Number of Pages: 2

7th Semester Regular / Back Examination 2015-16 INTRODUCTION TO DIGITAL SIGNAL PROCESSING BRANCH: CSE,IT Time: 3 Hours Max marks: 70 Q.CODE: T568

Answer Question No.1 which is compulsory and any five from the rest. The figures in the right hand margin indicate marks.

Q1	a) b) c) d)	Answer the following questions: Determine whether or not each of the following signals is periodic. In case a signal is periodic specify its fundamental period. a) $x(n) = 3\cos(5n+\pi/6)$ b) $x(n) = \cos(n/8)\cos(\pi n/8)$ What is time reversal property of z- transform? How many real multiplication and real additions are required to compute 16 point DFT using direct computation and DIT FFT algorithm? Determine the z- transform of the signal $x(n) = u(-n)$	(2 x 10)
	e) f) g) h) i) j)	Determine the 2 ⁻ transform of the signal $x(n) = u(n)$ Determine the even and odd component of the signal $x(n) = \{2,3,4,5,6\}$ \uparrow What is linear phase characteristics of FIR filter? Differentiate between linear convolution and circular convolution. Determine the power and energy of the unit step sequence. Write down the properties of convolution. Compute the N-point DFT of $x(n) = \delta(n-n_0)$ $0 < n_0 < N$	
Q2	a) b)	Compute the convolution $y(n) = x(n)^*h(n)$ $x(n) = u(n+1) - u(n-4) - \delta(n-5)$ h(n) = [u(n+2) - u(n-3)] .(3 - n) Determine the signal $x(n)$ whose z-transform is given by $X(z) = log(1+az^{-1}) z > a $	(5) (5)
Q3	Ĩ	Determine the z-transform of the following signals. a) $x(n) = n(-1)^n u(n)$ b) $x(n) = (1+n) u(n)$ Determine the equal signal $x(n)$ if its z transform is	(5)
Q4	b)	Determine the causal signal x(n) if its z-transform is $X(z) = (z^{-6}+z^{-7}) / (1-z^{-1})$ By means of DFT and IDFT determine the circular convolution of the sequences x ₁ (n) = {1,2,3,1} x ₂ (n) = {4,3,2,2}	(5) (10)

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Q5	a) b)	Establish the relation between DFT and Z-Transform Convert the analog filter with system function $H(s) = (s+0.1) / [(s+0.1)^2+9]$ into a digital IIR filter using impulse invariance method. The digital filter is to have resonant frequency of $\pi/2$.	(5) (5)
Q6	a)	Explain Decimation in frequency FFT algorithm.	(5)
	b)	Examine the system $y(n) = cos[x(n)]$ with respect to the properties like static or dynamic, linear or non-linear, time invariant or time varying, causal or non-causal.	(5)
Q7	a)	Determine the response of the system $y(n) = \frac{5}{6}y(n-1) - \frac{1}{6}y(n-2) + x(n)$ to the input signal $x(n) = \delta(n) - \frac{1}{3}\delta(n-1)$	(5)
	b)	Find the DFT of the sequence $x(n) = \{4,3,2,1\}$ using DIT FFT algorithm.	(5)
Q8	a) b) c)	Write short notes on any two: FIR filter using windowing technique DFT as a linear Transformation Overlap save filtering	(5 x 2)

c) Overlap save filteringd) Bilinear transformation Technique