GUJARAT TECHNOLOGICAL UNIVERSITY ME – SEMESTER I (NEW) – • EXAMINATION – SUMMER 2016

ME – SEMESTER I (NEW) – • EXAMINATION – SUMMER 2016 Subject Code: 3715203 Date:19/09			16
Subject Name: DIGITAL SIGNAL PROCESSING Time:02:30 pm to 05:00 pm Total Mark		70	
	1. 2. 3.	Attempt all questions. Make suitable assumptions wherever necessary. Figures to the right indicate full marks.	
Q.1	(a)	(i) Find the step response of a causal system given by $y(n) \circ y(n-1) = x(n)$ (ii) Find the impulse response of a causal system given by $y(n) \circ 2 \cos \theta y(n-1) + y(n-2) = x(n)$	07
	(b)	 (i) Find the Z-transform of sin(w₀n) u(n) (ii) Find the Z-transform of unit step function u(n) 	07
Q.2	(a)	 (i) What are the advantages of an FIR System over IIR System and similarly the disadvantage(s). (ii) Find the System Function H(z) of a system given by the difference equation y(n) = 0.85x(n) + 0.7x(n-1) do 0.4x(n-2) do 0.8 y(n-1) + 0.3 y(n-2). Determine its stability. 	07
	(b)	Show the butterfly structure based signal-flow graph for N-point Decimation-in- Time FFT algorithm with N=8	07
	(b)	Write the necessary equations for the N-Point Decimation-in-Time FFT algorithm for N=4 and plot its signal flow graph	07
Q.3	(a)	 By assuming symmetry condition h(n) = h(N-1-n) for an FIR system, obtain its frequency response (transfer function) and from the thus derived expression obtain its phase response by assuming, (i) N as an odd number (ii) N as an even number 	07
	(b)	Derive the stability criterion that the poles must lie inside the unit circle for a Linear Time Invariant System.	07
Q.3	(a)	Find the frequency response of an FIR system given by	07
	(b)	(i) $y(n) = \frac{1}{2}x(n) + x(n-1) + \frac{1}{2}x(n-2)$ (ii) $h(n) = 1$ for $0 \le n \le 6$ = 0 for $n > 6Find the impulse response of a causal system given by the difference equation y(n) + y(n-1) = x(n) - x(n-1)Also find the step response of the system using (i) recursion method and (ii) the$	07
Q.4	(a)	convolution sum. Use convolution to find $x(n)$ if $X(z)$ is given by	07

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(b) State and Prove the Sampling Theorem for the bandlimited class of signals.

Write a short notes on Niquist criterion and aliasing

OR

- Q.4 (a) Find H(z) and determine the poles and zeros and also the impulse response of 07 the system if the difference equation of the system is given by $y(n) + \frac{3}{4}y(n-1) + \frac{1}{8}y(n-2) = x(n) + x(n-1)$
 - (b) Find the order of the analog Chebyshev low pass system with the passband 07 frequency 100Hz and stopband frequency 600Hz and passband and stopband attenuations given by 1dB and 30dB respectively.
- Q.5 (a) Derive the pole locations of a stable and causal LTI analog Butterworth System 07 of order N.
 - (b) Obtain the difference equation for a digital Chebyshev lowpass system with the order 3 and passband frequency of 100Hz and by using Impulse Invariant Transformation method and choosing sampling rate of 10 kHz. (let $\varepsilon = 0.8$)

OR

- Q.5 (a) Realize an Linear Phase FIR system of the order N using the Direct Form 6 II 07 structure.
 - (b) Find the impulse response of a causal system given by the difference equation y(n) + y(n-1) = x(n) x(n-1) 07

Also find the step response of the system using (i) recursion method and (ii) the convolution sum.

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