GUJARAT TECHNOLOGICAL UNIVERSITY ME – SEMESTER-1 (NEW) EXAMINATION – WINTER 2016

Su	bject	t Code: 2710501 Date: 03/01/202	Date: 03/01/2017	
Su Tii Insi	Subject Name: Digital Signal Processing Algorithms Fime: 2:30 pm to 5:00 pm Total Mai Instructions:			
	1. 2. 3.	 Attempt all questions. Make suitable assumptions wherever necessary. Figures to the right indicate full marks. 		
Q.1	(a)	Write short note on application of discrete wavelet transform in signal processing	07	
	(b)	Check following systems for time variancy and linearity (i) $y(n)=[x(n)]^3$ (ii) $y(n)=n [x(n)]$	07	
Q.2	(a)	What is difference between convolution and correlation ? Find linear convolution of $x_1(n)=[2,1,0,1,2]$ and $x_2(n)=[5,3,2,1]$.	07	
	(b)	. Write short note on Bartlett and Welch method for spectral estimation.	07	
	(b)	Explain the relationship $\omega = \Omega^* T$ between frequency variable of continuous time and discrete time signals.	07	
Q.3	(a)	Convert the analog filter to a digital filter whose system function is	07	
		$H(s) = \frac{36}{(s+0.1)^2 + 36}$ Use impulse invariance mapping and digital filter have resonance frequency		
		$\omega_r=0.2\Pi$		
	(b)	Explain frequency sampling method for FIR filter design OR	07	
Q.3	(a)	The transfer function of an FIR filter (M=7) is M^{-1}	07	
		$H(z) = \sum_{n=0}^{\infty} h(n) z^{-n}$		
	(b)	Determine the magnitude response and show that the phase and group delays are constant. Explain bilinear transformation method of IIR filter design.	07	
Q.4	(a)	Find the Z transform of (i) $x(n) = -an(-n-1)$ (ii) $x(n) = nT^2u(nT)$	07	
	(b)	State and prove convolution property of Z transform.	07	
Q.4	(a)	Find the inverse Z transform,	07	
		$X(z) = \frac{z(1 - e^{-T})}{(z - 1)(z - e^{-T})}$		
	(b)	Find the Z transform using final value theorem,	07	
		$X(z) = \frac{2z^{-1}}{1 - 1.8z^{-1} + 0.8z^{-2}}$		
Q.5	(a) (b)	Find circular convolution between $x_1(n)=[1,2,2,1]$ and $x_2(n)=[2,1,1,2]$. Determine DFT of sequence	07 07	

$$h(n) = \begin{cases} \frac{1}{3}, & 0 \le n \le 2\\ 0, & otherwise \end{cases}$$

OR

Q.5	(a)	Explain DIF FFT algorithm with necessary diagrams in detail.	07
	(b)	Obtain direct form I and II realization using given transfer function	07
		$H(z) = \frac{z^{-1} - 3z^{-2}}{(10 - z^{-1})(1 + 0.5z^{-1} + 0.5z^{-2})}$	
