Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VI • EXAMINATION – WINTER • 2014

Subject Code: 160305 **Date: 03-12-2014**

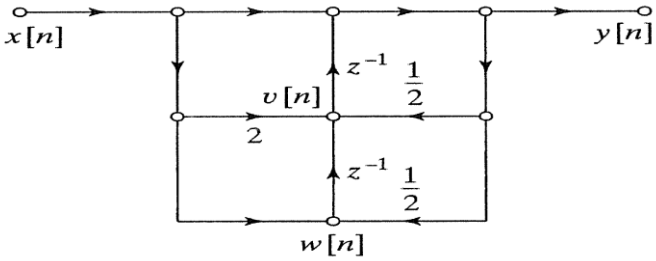
Subject Name: Biomedical Signal Processing

Time: 02:30 pm - 05:00 pm **Total Marks: 70**

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

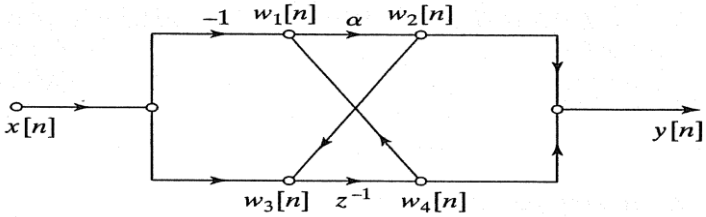
Q.1 **(a)** Consider below given signal flow graph **07**



1) Using node variable indicated, write the set of difference equations represented by this network.
2) Draw the flow graph of an equivalent system that is the cascade of two first order systems.

(b) Enlist all type of systems. Explain any two with example. **07**

Q.2 **(a)** Determine the system's transfer function for below given Signal flow graph. **07**



(b) Draw and explain structures of linear phase FIR systems. **07**

OR

(b) Draw the frequency response and z plane for **07**
a single zero at z = -1 and pole at z = 1
a single pole at z = -1 and zero at z=1

Q.3 **(a)** Determine digital filter using impulse invariance method for given H(s), **07**

$$H(s) = \frac{(s+2)}{(s+1)(s+3)}$$

(b) Obtain the coefficients of an FIR low pass filter to meet the following specifications using hamming window method **07**

Stop band attenuation > 50 dB

Pass band edge frequency 3.4KHz

Transition width 0.6 KHz

Sampling frequency 8KHz

OR

Q.3	**(a)**	Transfer function of simple RC circuit LPF can be given by H(s)= 1/ (s+1) and its bandwidth is known to be 1 rad/sec. use BZT method to design digital filter whose bandwidth is 20 Hz at sampling frequency 60 sps.	**07**
	(b)	Obtain the coefficient of FIR low pass filter using window method Passband edge frequency 1.5Khz Transition width 0.5Khz Stopband attenuation 750db Sampling frequency 8Khz.	**07**
Q.4	**(a)**	Prove that convolution of two sequences in time domain is equal to multiplication in frequency domain.	**07**
	(b)	Find the 4 point DFT of sequence x (n) = {1 2 2 1}.	**07**
		OR	
Q.4	**(a)**	Explain circular shift of a sequence in DFT.	**07**
	(b)	Differentiate between continuous, discrete and digital signals with necessary schematics.	**07**
Q.5	**(a)**	Explain GOERTZEL algorithm.	**07**
	(b)	Explain generalized architectures of DSP processors. List applications of DSP processors.	**07**
		OR	
Q.5	**(a)**	For the given x[n] = {1 2 3 0} sequence find corresponding 4 point DFT using DIT FFT.	**07**
	(b)	Discuss the process of ECG analysis for arrhythmia detection.	**07**

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