TE sem V E&C Scheme summer 2025

Duration 3 Hours **[Maximum Marks 80]**

5/6/25
EXTC

NOTE:-1) Question 1 is compulsory. Solve any four out of five questions.
2) Solve any three from the remaining five questions
3) Assume suitable data if necessary.
4) Figures to the right indicate full marks

Q1	a.	Find the IDFT of Y(K)= {1,0,1,0}	5
	b.	Find the linear phase realization of FIR filter defined as $H(Z) = \frac{1}{4} + \frac{1}{2}Z^{-1} + \frac{3}{4}Z^{-2} + \frac{1}{2}Z^{-3} + \frac{1}{4}Z^{-4}$	5
	c	Compare the computational complexity of FFT algorithm and DFT for N=4	5
	d.	What is pre-warping in BLT?	5
	e	Explain the concept of group delay and how it can affect the output of a filter.	5
O2,	a	Compute the circular convolution of x(n)={2,1,2,1}and h(n)={1,2,3,4,}by using FFT-IFFT method.	10
	b	Design an FIR lowpass filter using rectangular window with passband gain of 0 dB, cutoff frequency of 200 Hz, sampling frequency of 1 kHz. Assume the length of the impulse response as 7.	10
O3	a	Find DFT of sequence $x(n) = n + 1$ for $0 \leq n \leq 7$ using DIF-FFT algorithm	10
	b	Design an analog Butterworth filter that has a -2dB passband attenuation at a frequency of 20rad/sec and atleast -10dB stopband attenuation at 30rad/sec	10
O4	a	Determine H(z) that results when the bilinear transformation is applied to analog filter defined by equation $H(s) = \frac{s^2 + 4.525}{s^2 + 0.692\,s + 0.504}$ Assume T=1sec.	10

b Find the effect of coefficient quantization on pole locations of the given second order IIR system, when it is realized in direct form I. Assume a word length of 4 bits through truncation including a sign bit. 10

$$H(z) = \frac{1}{1 - 0.9\,z^{-1} + 0.2\,z^{-2}}$$

O5 a. i) Given a second-order transfer function H(Z).Find Cascade form realization. 10

$$H(z) = \frac{1+\frac{3}{4}z^{-1}+\frac{1}{8}z^{-2}}{1-\frac{5}{8}z^{-1}+\frac{1}{16}z^{-2}}$$

ii) Given a second-order transfer function H(Z).Find parallel form realization.

$$H(z) = \frac{(1+z^{-1})(1+2z^{-1})}{(1+\frac{1}{2}z^{-1})(1-\frac{1}{4}z^{-1})(1+\frac{1}{8}z^{-1})}$$

b A FIR filter is given by, $y(n) = x(n) + \frac{2}{5}x(n-1) + \frac{3}{4}x(n-2) + \frac{1}{3}x(n-3)$ 10

Draw the Lattice structure.

Q6 a. Explain application of DSP in echo cancellation. 10

b. Explain the concept of overflow limit cycle oscillations 10