05-06-2026 TE EXTC SEM-V C SCHEME DTSP QP CODE: 20012283

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

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.	Compare DIT-FFT and DIF-FFT algorithms.	**5**
	b.	Consider the FIR system with transfer function: $H(z) = (1 - 1.2z^{-1})(1 - 0.8\,z^{-1})$ .Determine whether the system is minimum-phase, maximum-phase, or mixed-phase.	**5**
	c	Compute the number of complex multiplications and complex additions required in a radix-2 FFT for N=4.	**5**
	d.	Explain group delay and phase delay in FIR filters.	**5**
	e	Explain aliasing in Impulse Invariance Transformation technique used in digital filter design.	**5**
Q2)	a	Compute the linear convolution of following two discrete-time signals using FFT-IFFT method x[n]={1,3,2,4}, h[n]={2,1,0,1}.	**10**
	b	Using the Hamming window technique, design a high-pass FIR filter for the following specifications: Passband gain: 1 (0 dB), Cutoff frequency: 300 Hz Sampling frequency: 2 kHz , Length of impulse response: 9	**10**
Q3)	a	Consider the sequence x(n) ={1,0,2,1,3,0,1,2 } Compute the 8-point DFT using the DIF-FFT algorithm.	**10**
	b	For a low-pass analog Butterworth filter with the following specifications: • Pass band attenuation: ≤ 1 dB at ωp=50 rad/sec • Stop band attenuation: ≥ 20 dB at ωs=80 rad/sec Determine the minimum order of the Butterworth filter and also find the cut off frequency of the analog filter.	**10**
Q4	a	Determine H(z) that results when the IIT is applied to analog filter defined by equation $\mathbf{H(s)} = \frac{12}{(s+1)(s+4)}$ Assume T= 0.2 sec.	**10**
	b	Explain the terms limit cycle oscillation, dead band with suitable example.	**10**
O5	a	Given a second-order transfer function H(Z).Find cascade and parallel realizations.$\mathbf{H(z)} = \frac{0.7\,z^{-1} - 0.25\,z^{-2}}{1 + 0.1\,z^{-1} - 0.72\,z^{-2}}$	**10**
	b	How can overflow errors in digital filters be controlled using appropriate scaling methods?	**10**
Q6	a.	Explain how DSP techniques are applied in the analysis and interpretation of ECG signals.	**10**
	b.	What is subband coding, and how does it improve speech signal representation and compression.	**10**

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