K. J. Somaiya Institute of Technology, Sion, Mumbai-22
(Autonomous College Affiliated to University of Mumbai)

Instructions:
(1) All questions are compulsory.
(2) Draw neat diagrams wherever applicable.
(3) Assume suitable data, if necessary.

Q. No.	Question	Max. Marks	CO	BT level
Q 1	Solve any **two** questions out of three: (05 marks each)	10		
a)	Consider filter with transfer function $H(z) = \dfrac{z^{-1}-a}{1-az^{-1}}$, Identify the type of filter, plot the response and justify it.		CO1	U
b)	Draw the butterfly structure of 8 point DITFFT		CO2	U
c)	Explain application of DSP processor in ECG signal analysis.		CO6	U
Q 2	Solve any **two** questions out of three: (05 marks each)	10		
a)	State and prove linearity property of DFT. Calculate DFT of sequence x (n) = {1, 1, 2, 2, 3, 3}		CO2	U
b)	Design a linear phase FIR band stop filter to reject frequencies in the range 0.4π to 0.65π rad/samples using rectangular window by taking 7 samples of window sequence.		CO3	A
c)	Define minimum phase, maximum phase and mixed phase system. Draw ideal and actual frequency response characteristics of various types of filters and explain each in brief.		CO1	U
Q.3	Solve any **two** questions out of three. (10 marks each)	20		
a)	Show a mapping from S plane to Z Plane using Bilinear Transformation Technique. Design a Butterworth digital IIR high pass filter using Bilinear Transformation by taking T = 0.1 second to satisfy following specifications. $0.6 \le \|H (e\,j\omega)\| \le 1$ $0.7\pi \le \omega \le \pi$ $\|H(e\,j\omega)\| \le 0.1$ $0 \le \omega \le 0.35\pi$		CO3	A
b)	Compute IDFT of sequence given as X (K) = {7, -0.707-0.707j, -j, 0.707-0.707j, 1, 0.707+0.707j, j, -0.707+0.707j} using DIF FFT algorithm.		CO2	U

	Nov – Dec 2024		
	(B. Tech.) Program: EXTC Scheme:-II & II B		
	Regular/Supplementary Examination: TY/ Semester: V		
Course Code: EXC503	and Course Name: Discrete Time Signal Processing		
Date of Exam: 02/12/2024	Duration: 02.5 Hours		Max. Marks: 60

			CO	
c)	What is Dual Tone Multi frequency? Explain how it works?		CO6	U
Q.4	Solve any **two** questions out of three. (10 marks each)	20		
a)	What are the types of quantization employed in digital systems? Explain it with example. Sketch input output characteristics of quantizer used for truncation.		CO1	U
b)	Design a linear phase FIR high pass filter using Hamming window with cut-off frequency $\omega c = 0.8\,\pi$ rad/samples and $N = 7$.		CO4	A
c)	Draw direct form-I and form-II structure of following filter transfer function given below. $$H(Z) = \frac{0.1708 + 0.3415Z^{-1} + 0.1708Z^{-2}}{1 - 0.5407Z^{-1} + 0.2237Z^{-2}}$$		CO5	A

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