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

Nov – Dec 2025
B. Tech Program: EXTC Scheme III
Regular Examination: TY Semester: V
Course Code: EXC502 and Course Name: Discrete Time Signal Processing
Date of Exam: 01/12/25 Duration: 02.5 Hours Max. Marks: 60

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)	FIR filter have impulse response classify with min, max, mixed phase $H(z_1)=\{1,0.707,0.25\}$ $H(z_2)=\{1,1.414,1\}$		CO1	U
b)	Calculate DFT x(n) = {1,1,2,2,3,3}		CO2	U
c)	For second order filter $H(z) = \frac{1}{(1-0.5z^{-1})(1-0.45z^{-1})}$ Study the effect of shift in pole location with 3-bit coefficient representation in direct form.		CO5	U
Q 2	Solve any **two** questions out of three: (05 marks each)	10		
a)	Calculate 4-point DFT using DIT FFT x(n)={1,3,2,0}		CO3	U
b)	Draw realization structure of Direct form-I and II $H(z) = \frac{0.1708+0.3415z^{-1}+0.1708z^{-2}}{1-0.5407z^{-1}+0.2237z^{-2}}$		CO4	A
c)	Explain application of DSP processor in bio medical applications.		CO6	U
Q.3	Solve any **two** questions out of three. (10 marks each)	20		
a)	For given sequences, x (n)={1,2,3,1} & h (n)={5,6,7,8} , compute circular convolution using DFT and IDFT method.		CO2	U
b)	An LTI system is characterized by the difference equation, y (n) = 0.68y (n – 1) + 0.15x (n). The input signal x(n) has a range of -5V to +5V,		CO5	U

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	represented by 8-bits. Find the quantization step size, variance of the error signal and variance of the quantization noise at the output.			
c)	Design Butterworth digital IIR LPF using bilinear transformation by taking T= 1 Sec to satisfy the following specifications . $0.707 \leq \lvert H(e^{jw})\rvert \leq 1.0$; for $0 \leq w \leq 0.3\pi$ $\lvert H(e^{jw})\rvert \leq 0.2$; for $0.75\pi \leq w \leq \pi$		CO4	A
Q.4	Solve any **two** questions out of three. (10 marks each)	20		
a)	Identify the filter based on pass band i) $H(z) = \frac{z}{z+0.6}$ ii) $H(z) = \frac{z-1}{z+1}$		CO1	U
b)	Design FIR bandpass filter to pass frequencies in the range 1.5 kHz to 3 kHz and sampling frequency of 8 kHz with 7 samples using Fourier series method .		CO3	A
c)	Explain in detail Dual Tone Multi Frequency in DSP application		CO6	U

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