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**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/II B  
 Supplementary Regular Examination: TY Semester: V  
 Course Code: EXC502 and Course Name: Discrete Time Signal Processing  
 Date of Exam: 04/02/26 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 <b>two</b> questions out of three: (05 marks each)	10		
a)	Consider filter with transfer function $H(z) = \frac{z^{-1}-a}{1-az^{-1}}$ , Identify the type of filter, plot the response and justify it.		CO1	U
b)	Draw the butterfly structure of 8 point DIFFFT		CO2	U
c)	Explain application of DSP processor in ECG signal analysis.		CO6	U
Q 2	Solve any <b>two</b> questions out of three: (05 marks each)	10		
a)	Calculate DFT of sequence $x(n) = \{1, 2, 2, 2, 1\}$		CO2	A
b)	Differentiate Impulse Invariant and Bilinear Transformation method.		CO4	U
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 <b>two</b> questions out of three. (10 marks each)	20		
a)	Design a linear phase FIR low pass filter using rectangular windows by taking 7 samples of window frequency with cutoff frequency $\omega_c = 0.2 \pi$ rad/samples.		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 DIT FFT algorithm.		CO2	A
c)	What is Dual Tone Multi frequency? Explain how it works?		CO6	U
Q.4	Solve any <b>two</b> questions out of three. (10 marks each)	20		
a)	What are the types of quantization employed in digital systems? Explain it with an example. Sketch input output characteristics of quantizer used for truncation.		CO5	U

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**Supplementary**

b)	Design a linear phase FIR high pass filter using Hamming window with cut-off frequency $\omega_c = 0.8 \pi$ rad/samples and $N = 7$ .	CO3	A
c)	A two pole low pass filter has the system function $H(Z) = \frac{b_0}{(1-pZ^{-1})^2}$ Determine the values $b_0$ and $p$ such that the frequency response $H(\omega)$ satisfies the condition $H(0) = 1$ and $\left H\left(\frac{\pi}{4}\right)\right ^2 = \frac{1}{2}$	CO1	U

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