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

Subject Code: EXC503 Subject Name: Discrete Time Signal Processing Date: 31/05/2023

May/June 2023

Program: B.Tech. (Electronics and Telecommunication)
Examination: TY Semester: V
Course Code: EXC503 and Course Name: **Discrete Time Signal Processing**
Duration: 2.5 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 six questions out of eight:**	**12**		
i)	Explain ECG signal analysis	02	6	U
ii)	Find DFT of $\delta(n)$	02	2	U
iii)	Why a band-reject filter is called a notch filter?	02	1	U
iv)	Compare Symmetric and Anti-symmetric FIR filter	02	3	U
v)	What is frequency wrapping? How its effect can be eliminated?	02	3	U
vi)	State and explain quantization noise	02	5	U
vii)	Explain Frequency sampling structure of FIR system	02	4	U
viii)	Compare DIT and DIF algorithm	02	2	U
Q.2	**Solve any four questions out of six.**	**16**		
i)	Obtain H(z) from H(s) when T= 1 sec and $H(s) = \frac{1}{s^2+2s+1}$, using Bilinear transformation	04	3	A
ii)	State and prove linearity property of DFT	04	2	U
iii)	Explain Gibb's phenomenon	04	3	U
iv)	Realize the filter transfer function, $(z) = \frac{1}{(1+2z^{-1})(1-z^{-2})}$.	04	5	A
v)	Perform circular convolution of the sequences, $x_1(n) = \{2,1,2,1\}$ and $x_2(n) = \{1,2,3,4\}$	04	2	A
vi)	State how DSP can be used for Dual Tone Multi-Frequency Signal Detection.	04	6	U

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Q.3	**Solve any two questions out of three.**	**16**		
i)	Design a Butterworth digital IIR low pass filter using Bilinear transformation by taking sampling frequency 8 KHz, to satisfy the following specifications. $0.75 \leq \lvert H(e^{j\omega})\rvert \leq 1 \quad : \quad 0 \leq \omega \leq 0.25\pi$ $\lvert H(e^{j\omega})\rvert \leq 0.23 \quad : \quad 0.63\pi \leq \omega \leq \pi$	08	3	A
ii)	Explain Truncation and Rounding method with graph.	08	5	U
iii)	Explain Short Time Spectral Analysis of Speech signal using DSP	08	6	U
Q.4	**Solve any two questions out of three.**	**16**		
i)	Obtain the cascade structure of the FIR filter, defined by the transfer function, $H(z) = (a_0 + a_1 z^{-1} + a_2 z^{-2})(b_0 + b_1 z^{-1})$	08	4	A
ii)	Draw ideal and actual frequency response characteristics of various types of filters and explain each in brief.	08	1	U
iii)	Compute 8-point DFT of x (n) = (1, 1, 3, 3, 1, 1, 2, 2) by redix-2 DIT-FFT.	08	2	A

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