

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

April - May 2024
 Nov - Dec 2024

Program: B. Tech Scheme: II/II B Regular/Supplementary Examination: TY Semester: VI Course Code: EXDLC6051 and Course Name: Speech and Audio Processing Date of Exam: 25-05-24 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.				
		Max. Marks	CO	BT level
Q 1	Solve any six questions out of eight:	12		
i)	Describe the key components of Feedback Mechanisms.	2	1	U
ii)	When is it difficult to locate the beginning and end of an utterance.	2	2	U
iii)	Describe the key components of Neural Control.	2	3	U
iv)	Describe Unvoiced Fricatives	2	4	U
v)	Describe Un voiced Stops.	2	5	U
vi)	Write an expression for short time prediction error	2	5	U
vii)	Explain feature extraction in speech recognition system.	2	6	U
viii)	Explain Auditory Masking.	2	6	U
Q.2	Solve any four questions out of six.	16		
i)	Describe the average magnitude plot for any one word with wave form diagram.	4	1	U
ii)	Explain Diphthongs with appropriate diagram.	4	2	U
iii)	Explain Sound propagation and discuss the effects that are considered on the detailed acoustic theory.	4	3	U
iv)	Explain Speech vs. Silence discrimination using energy and Zero-crossings for utterance six with its wave diagram	4	4	U

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v)	Explain the source-filter model of CELP	4	5	U
vi)	Explain the Threshold of hearing	4	6	U
Q.3	Solve any two questions out of three.	16		
i)	Derive characteristic acoustic impedance of the tube.	8	1	U
ii)	Explain Pitch Period Estimation using a Parallel Processing approach with proper example	8	3	U
iii)	By definition $X_n(e^{j\omega}) = a_n(\omega) - jb_n(\omega) = X_n(e^{j\omega}) e^{j\theta_n(\omega)}$ Obtain expressions for $ X_n(e^{j\omega}) $ and $\theta_n(\omega)$ in terms of $a_n(\omega)$ and $b_n(\omega)$	8	5	U
Q.4	Solve any two questions out of three.	16		
i)	Explain autocorrelation pitch detector with proper diagram.	8	2	U
ii)	Explain DRNL with a proper block diagram	8	4	U
iii)	If the sequences $x(n)$ and $w(n)$ have normal Fourier transforms $X(e^{j\omega})$ and $W(e^{j\omega})$, then prove that the short-time Fourier transform $X_n(e^{j\omega}) = \sum_{m=-\infty}^{\infty} x(m)w(n-m)e^{-j\omega m}$ Can be put in the form $X_n(e^{j\omega}) = \frac{1}{2\pi} \sum_{-\pi}^{\pi} W(e^{j\theta})e^{j\theta n} X(e^{j(\omega+\theta)})d\theta$	8	6	A
