

Hall Ticket Number:

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Code No. : 17453 (C) N/O

VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS), HYDERABAD*Accredited by NAAC with A++ Grade***B.E. (E.C.E.) VII-Semester Main & Backlog Examinations, Dec.-23/Jan.-24****Speech and Audio Signal Processing (PE-II)**

Time: 3 hours

Max. Marks: 60

*Note: Answer all questions from Part-A and any FIVE from Part-B***Part-A (10 × 2 = 20 Marks)**

Q. No.	Stem of the question	M	L	CO	PO	PSO
1.	List few applications of Digital speech processing.	2	2	1	1	3
2.	Define phoneme in speech processing	2	1	1	1	3
3.	Define Short Time Auto Correlation function.	2	2	2	2	3
4.	Define Speech Spectrogram and list components of speech Spectrogram?	2	1	2	2	3
5.	What is speech synthesis, and how does it differ from speech recognition?	2	2	3	1	3
6.	What is phone-based synthesis, and how does it differ from other methods of speech synthesis?	2	2	3	1	3
7.	What is Linear Predictive Coding and list the objectives.	2	1	4	1	3
8.	Distinguish between waveform coding and parametric coding techniques	2	2	4	2	3
9.	List the problems in Automatic Speech Recognition.	2	1	5	1	3
10.	List the sequence of decision-making steps in an ASR system.	2	2	5	1	3
Part-B (5 × 8 = 40 Marks)						
11. a)	Analyze the Source-filter model of speech production.	4	3	1	2	3
b)	The signal samples be given by 1.8, 2.4, 3.5, 5.1, 6.2, 9.7, 11.2, 13.2, 12.6, 10.2, 7.3, 5.9, 8, 7.4, 5.2, 3.1 and 1.8. Find the step size and quantization noise power for a signal and for a difference signal if a four bit quantizer is used.	4	3	1	2	3
12. a)	Discuss how to classify speech signal as a voiced and unvoiced using energy and zero crossing rate.	4	4	2	2	3
b)	Explain how pitch and formants are estimated from Cepstrum of the speech.	4	4	2	2	3
13. a)	How does text-to-speech (TTS) technology work, and what are the key components of a TTS system?	4	2	3	2	3

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b)	Illustrate the concept of the pitch prediction error in linear predictive synthesis and its importance in reproducing natural speech.	4	3	3	2	3
14. a)	What is sub-band coding. Explain how it split the frequency content of a speech signal with help of a diagram.	4	2	4	2	3
b)	Elaborate the basic principles of transform coding and discuss its applications.	4	3	4	2	3
15. a)	Write a short note on Dynamic time warping (DTW).	4	1	5	1	3
b)	Analyze the dynamic time warping algorithm for the patterns $P1=\{1,6,9,6,5\}$ and $P2=\{2,6,8,9,8,3\}$.	4	3	5	2	3
16. a)	Describe the difference between uniform quantization and non-uniform quantization in speech signal processing?	4	2	1	2	3
b)	Discuss homomorphic system for convolution.	4	3	2	2	3
17.	Answer any <i>two</i> of the following:					
a)	Write a short note on articulator speech synthesis.	4	1	3	1	3
b)	Explain the trade-offs between bit rate and speech quality in speech coding, and how do different coding techniques strike a balance between the two?	4	3	4	2	3
c)	What are the main challenges in ASR technology when dealing with various accents, dialects, and languages?	4	2	5	2	3

M : Marks; L: Bloom's Taxonomy Level; CO; Course Outcome; PO: Programme Outcome

i)	Blooms Taxonomy Level – 1	20%
ii)	Blooms Taxonomy Level – 2	35%
iii)	Blooms Taxonomy Level – 3 & 4	45%

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