PAPER ID-310089

Roll No:

BTECH
(SEM VII) THEORY EXAMINATION 2024-25
SPEECH PROCESSING

TIME: 3 HRS   **M.MARKS: 100**

Note: Attempt all Sections. In case of any missing data; choose suitably.

SECTION A

1.   Attempt *all* questions in brief.   **2 x 10 = 20**

Q no.	Question	CO	Level
a.	List the key assumptions in the acoustic theory of speech production.	1	K1
b.	Define acoustic phonetics.	1	K1
c.	What is the purpose of short-time energy in speech processing?	2	K1
d.	How does AMDF differ from the autocorrelation method for pitch detection?	2	K2
e.	Explain the purpose of spectrographic displays in speech processing.	3	K2
f.	List the properties of short-time Fourier transforms.	3	K1
g.	What is a homomorphic vocoder, and where is it used?	4	K2
h.	How can formants be estimated using homomorphic methods?	4	K3
i.	Define prediction error in the context of LPC.	5	K1
j.	What is the significance of normalized mean square error in LPC?	5	K2

SECTION B

2.   Attempt any *three* of the following: **10 x 3 = 20**

Q no.	Question	CO	Level
a.	Explain the mechanism of speech production and its relationship with acoustic phonetics.	1	K2
b.	Explain the concept of the short-time average zero-crossing rate and its role in distinguishing speech from silence.	2	K2
c.	Describe the properties of short-time Fourier analysis and its importance in speech processing.	3	K1
d.	Evaluate the benefits and limitations of homomorphic processing in real-time speech applications.	4	K5
e.	Analyze the relationship between various speech parameters in LPC and lossless tube models.	5	K4

SECTION C

3.   Attempt any *one* part of the following: **10 x 1 = 10**

Q no.	Question	CO	Level
a.	Describe the acoustic theory of speech production and its significance in speech signal modeling.	1	K2
b.	Illustrate the lossless tube models used in speech signal processing. How do they simulate the vocal tract?	1	K3

4.   Attempt any *one* part of the following: **10 x 1 = 10**

Q no.	Question	CO	Level
a.	Define short-time energy and average magnitude. How are these parameters used to analyze speech signals?	2	K1
b.	Evaluate the effectiveness of short-time autocorrelation and AMDF methods for pitch detection.	2	K5

Roll No:

BTECH
(SEM VII) THEORY EXAMINATION 2024-25
SPEECH PROCESSING

TIME: 3 HRS   **M.MARKS: 100**

5.   **Attempt any *one* part of the following:**   **10 x 1 = 10**

Q no.	Question	CO	Level
a.	Analyze the use of spectrographic displays in visualizing speech signals.	3	K4
b.	Explain the design and implementation of filter banks using the FFT-based method.	3	K2

6.   **Attempt any *one* part of the following:**   **10 x 1 = 10**

Q no.	Question	CO	Level
a.	Explain the computation of the complex cepstrum of a speech signal.	4	K2
b.	Define the homomorphic system for convolution and its application in speech processing.	4	K1

7.   **Attempt any *one* part of the following:**   **10 x 1 = 10**

Q no.	Question	CO	Level
a.	Describe the autocorrelation method used in LPC and its computational steps.	5	K2
b.	Define the basic principles of linear predictive analysis in speech processing.	5	K1