B.Tech Even Semester Examination, May, 2025

Electronics & Communication Engineering

(6th Semester)

Course No: ECC-607B

(Speech Audio Processing)

Full Marks: 70

Pass Marks: 28

Time: 3 hours

Note:

1. Attempt any five questions taking one from each unit.
2. Begin each answer in a new page
3. Answer parts of a question at a place
4. Assume reasonable data wherever required
5. The figure in the right margin indicates full marks for the question
6. All the mathematical symbols and abbreviations have their usual meanings.

UNIT-I

1. a) With suitable diagram explain the physiological mechanism of speech production

   b) Describe the Manners and Place of Articulation in sound production. 7+7

2. a) What is Speech Perception?

   b) How Basilar Membrane characterises different frequency components to perceive sound? Explain.

   c) Why Do We Have Two Ears? Explain. What are the different parts of a Human Ear and Mentions their purpose 2+6+6

UNIT-II

3. a) Explain the short time processing of speech signals.

   b) Define the terms

   i) Short time energy

   ii) Short time Average Zero Crossing Rate (ZC rate)

   iii) Auto Correlation Function (ACF) 5+9

4. a) Why is speech signal analyzed in short time?

   b) Distinguish between parameters and features of speech signal

   c) Why is windowing performed in speech signal analysis? 4+6+4

UNIT-III

5. a) Explain the need for quantization. Define quantization noise.

   b) Define A- law and Mu-law companding.

   c) Explain the Filter Bank analysis technique for analyzing speech signal. 4+4+6

6. a) Define quantization and quantization error.

   b) Explain the effect of quantization noise.

   c) Differentiate narrow band and wideband coding? 4+4+6

UNIT-IV

7. a) Explain the basic principles of Liner Predictive Coding (LPC).

   b) Explain the AR and ARMA model for representing speech signal 8+6

8. a) Explain the Cepstral analysis technique for analyzing speech.

   b) Explain Sub band coding technique of speech signals 8+6

UNIT-V

9. a) Explain Mel-Frequency Cepstral Coefficients (MFCC)

   b) Explain the Multi-Microphone Adaptive Noise Cancellation (ANC) 10+4

10. a) Explain a hybrid coder (CELP)?

    b) Explain how coders are classified?

    c) Explain waveform coding of speech signals? 5+4+5

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