

B.E. 2008 (Electronics & Telecommunication)

SPEECH PROCESSING

(Elective - III) (Semester - II)

Time: 3 Hours

Max. Marks : 100

Instructions to the candidates:

- 1) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8, Q.9 or Q.10, Q.11 or Q.12
- 2) Answers to the two sections should be written in separate answer books.
- 3) Neat diagrams must be drawn wherever necessary.
- 4) Figures to the right side indicate full marks.
- 5) Use of Calculator is allowed.
- 6) Assume Suitable data if necessary

SECTION I

- Q1) a) Explain LTV model for speech production system ? State the limitations of LTI model for speech production system? [9]
- b) Explain the method to separate Voiced and Unvoiced part of speech signal using short time ZCR and short time energy . [9]

OR

- Q2) a) What is pitch? Explain the AMDF method to estimate the pitch of the speech signal. [8]
- b) Define the following terms, [6]
- 1) Short time ZCR
 - 2) Short time Energy
 - 3) Short time Autocorelation
- c) Explain the .wav file format. [4]
- Q3) a) Explain with the help of block schematic the formant estimation technique using cepstrum method. [8]
- b) Explain Levinson-Durbin recursive algorithm for calculation of predictor coefficients. [8]

OR

- Q4) a) Explain the method to find LPC Coefficients using autocorrelation method. [8]
- b) Find LPC Coefficients α_1, α_2 for second order filter using Levinson-Durbin recursive algorithm for the matrix equation as shown below. [8]

$$\begin{bmatrix} R(0) & R(1) \\ R(1) & R(0) \end{bmatrix} \begin{bmatrix} \alpha_1 \\ \alpha_2 \end{bmatrix} = \begin{bmatrix} R(1) \\ R(2) \end{bmatrix}$$

- Q5) a) What is MFCC ? Explain the method to calculate MFCC using block diagram ? [8]
- b) With the help of block diagram explain homomorphic speech processing? Also, state advantages of homomorphic speech processing. [8]

OR

- Q6) a) Explain in detail Bark scale and Mel scale. State its significance in speech processing. [8]
b) Compare LPC and MFCC. [8]

SECTION II

- Q7) a) What is speech enhancement? Explain the spectral subtraction method of speech enhancement technique in detail. [8]
b) What is wiener filter? Explain the method of speech enhancement using wiener filter technique. [8]

OR

- Q8) a) Explain the method of speech enhancement by re-synthesis method and state its advantages with other methods. [8]
b) Explain any two applications of Speech Enhancements in detail. [8]
Q9) a) What are the major hurdles in designing Automatic Speech Recognition system. Explain how to overcome these hurdles. [8]
b) Explain with block schematic the speaker identification system. [8]

OR

- Q10) a) Explain different features of the speech required for speaker verification system. How these features are different from speaker identification system features. [8]
b) Compare speaker identification system and speaker verification system. [8]
Q11) a) Draw and Explain isolated digit recognition system using HMM. [8]
b) State different distortion measuring techniques used for Automatic Speech Recognition system and compare them. [6]
c) State and Explain any two transform domain techniques used for speech processing. [4]

OR

- Q12) a) Explain in brief Text-to-Speech conversion system with block schematic? State different applications of TTS. [8]
b) What are three basic problems associated with HMMs. Give their solution. [6]
c) Explain application of Spectrogram for speech processing. [4]