

Time: 3 Hours

Marks: 80

- N.B: (1) Question No. 1 is compulsory
 (2) Attempt any Three questions from the remaining Five questions
 (3) Figures to the right indicate full marks

1. (a) What are the properties of the autocorrelation function? [4]
 (b) What is phoneme? Explain in detail about semivowels and diphthongs? [4]
 (c) How are formants useful in speech processing? [4]
 (d) Describe the equations involved in the design of an all-pole filter of order 1. [4]
 (e) What are the uses of pitch period estimation? [4]

2. (a) Describe the speech production mechanism and identify the different categories of excitation? [10]
 (b) Explain the different losses involved in modeling of the vocal tract. Explain how each of them affects the resonance frequency of vibration of the vocal cords [10]

3. (a) Explain the different time domain parameters derived from the speech signal. Briefly describe with equations how they can be computed. [10]
 (b) Explain narrowband spectrogram of a speech signal with suitable examples [10]

4. (a) (i) What is 'complex cepstrum' of a speech signal? Specify its properties, with related equations?. [8]
 (ii) What is the need to generate Linear Predictor coefficients for a speech signal? [2]
 (b) Levinson-Durbin acts as a recursion function for calculation of prediction coefficients. Explain? [10]

5. (a) Compare and contrast the different speech standards. [10]
 (b) How would you compare two speech signals using Dynamic Time Warping algorithm. [10]

6. (a) Explain Text-to-Speech conversion using a block schematic? State the different applications of TTS [8]
 (b) Explain the different challenges involved in the design of a speaker recognition system. [7]
 (c) How is HMM used for speech recognition? [5]
