Q. P. Code: 38795

Duration: 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) Explain the procedure to calculate the short time energy of speech signal ? [4]
   (b)What is prosody with regards to speech synthesis? [4]
   (c) Explain formation of vowels either by showing a vowel quadrilateral or a vowel triangle. [5]
   (d) Is the speech signal stationary or non-stationary? Justify your answer. [4]
   (e) Explain the use of wideband spectrogram of a speech signal. [3]

2. (a) What are the various forms of STFT? Give expressions for each case. Explain interpretation of short-time spectrum analysis as filters with suitable block diagram. [8]
   (b) Elaborate with suitable equations any three methods for estimating the pitch of a speech signal. [6]
   (c) Write a note on production of semivowels and nasals. How can we differentiate them on the basis of their formant values? [6]

3. (a) Explain how Linear Prediction Filter for speech prediction represents an all pole filter? What should be the order of the filter to be considered for practical applications? [10]
   (b) Draw the lattice structure of an all pole filter of order one showing proper equations. [10]

4. (a) Explain with a suitable block diagram and proper waveforms a procedure to separate the vocal tract frequency response from the excitation in a speech signal. [10]
   (b) Explain the necessity of the mel scale with reference to the hearing mechanism. [10]

5. (a) Explain with suitable equations the Levinson Durbin algorithm for calculation of the predictor coefficients. [8]
   (b)Explain the applications of speech processing in detail. [5]
   (c) Explain with a suitable example the dynamic time warping algorithm. [7]

6. (a) What is CELP? Explain the US federal standard 1016 using CELP? [10]
   (b) Draw the state diagram for HMM as a general case and explain how you would develop a transition matrix from the same. [10]

****