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) Explain with suitable examples the production of fricatives and stops.   [4]
   (b) How is the code book generated for CELP?   [4]
   (c) Explain concatenative synthesis. What is the advantage of using sub-word
       units?   [4]
   (d) How can we differentiate between semivowels and nasals on the basis of their
       formant values?   [4]
   (e) Explain the meaning of intonation. What are the different intonations used in general
       speaking?   [4]

2. (a) How is STFT different from Fourier Transform? Explain the difference with respect
       to the speech signal.   [7]
   (b) Compare and contrast the pitch detection methods by using Cepstral coefficients and
       LPC parameters.   [7]
   (c) Explain in detail how the radiation at the lips affect the resonance frequency of
       the vocal cords.   [6]

3. (a) Explain with proper equations how Linear Prediction Filter for speech prediction
       represents an all pole filter?   [10]
   (b) Perform the LPC analysis to determine the predictor coefficients given the
        autocorrelation sequence as $r_{xx}(0) = 2.1$, $r_{xx}(1) = 1.5$, $r_{xx}(2) = 0.9$.   [10]

4. (a) Design a Homomorphic processing system for filtering of a speech signal.   [10]
   (b) Draw and explain the schematic representation of the ear. Emphasize on the human
       hearing mechanism.   [10]

5. (a) What is the significance of the Levinson Durbin algorithm. State the necessary
       equations involved during the execution of the algorithm for calculation of the
       predictor coefficients.   [8]
   (b) Explain the applications of speech processing in detail.   [5]
   (c) What are the different speech standards? Explain any one of them in detail   [7]

6. (a) Explain Bayes rule for class selection.   [6]
   (b) Draw the block schematic for a formant synthesizer. Explain the function of each
       block.   [10]
   (c) In linguistics what is the meaning of prosody?   [4]

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