Time: 3 hours   **Marks: 80**

NB: 1. Q.1 is compulsory
        2. Attempt any three questions from remaining.

Q.1   a) Is the speech signal a stationary or non-stationary signal? Justify your answer.   **(04)**

        b) What is vowel triangle?   **(04)**

        c) Explain discrete time model for speech production.   **(04)**

        d) Justify the need for short time analysis in speech processing.   **(04)**

        e) What are the properties of auto correlation function?   **(04)**

Q.2   a) Explain how median smoothing is applied for speech signal.   **(10)**

        b) Explain the mechanism for production of nasal /m/ /n/ phonemes.   **(10)**

Q.3   a) Draw and explain the schematic representation of the ear. Emphasize on the human

            hearing mechanism.   **(10)**

        b) Explain voice excited channel vocoder.   **(10)**

Q.4   a) With related equations explain the terms: i) short time energy   ii) short time average

            magnitude   iii) short time zero crossing rate. How do you distinguish between voiced

            and unvoiced segments based on these parameters?   **(07)**

        b) Explain the applications of speech processing in detail.   **(05)**

        c) Describe Differential Quantization with the help of diagram.   **(08)**

Q.5   a) Explain overlap addition method for short time synthesis.   **(10)**

        b) Write short notes on: **(10)**

                i) Speech recognition using Artificial Neural Network.

                ii) Speech recognition pattern comparison techniques.

Q.6   a) Explain Fourier Transform Interpretation of STFT.   **(05)**

        b) Explain in detail the procedure for speech Vs silence discrimination.   **(08)**

        c) Compare PCM, DM, and DPCM.   **(07)**

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