EBAS

Speech Processing

Sem VIII
EXTC
18|5|16
Elective

Q.P. Code : 722901

(3 Hours) **[Total Marks : 80**

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

1. (a) Explain the human speech production system with the help of a schematic representation of its physiological mechanism. **5**
   (b) Explain the homomorphic processing system for convolution with a block schematic. **5**
   (c) Explain basic principles of linear predictive analysis. **5**
   (d) Explain dynamic"time-warping with regard to speech recognition. **5**

2. (a) Why do we consider short time representation of speech signals? What do you mean by windowing? Explain the concept of short-time speech processing with suitable general block diagram. **7**
   (b) A speech signal is sampled at a rate of 20000 samples/sec (20 kHz). A segment of length 1024 samples is selected and the 1024-Point FFT is computed. **8**
      (i) What is the frequency resolution (spacing in Hz) between the FFT values?
      (ii) If the first peak in the spectrum occurs at 15th to sample, what is the pitch frequency? Hence, find out the period of one glottal cycle.
   (c) Define threshold of hearing, intensity level of sound, and sound pressure level (SPL). Give the typical dB values of SPL for threshold of hearing, noisy restaurant, and jet engine. **5**

3 (a) Write a note on spectrographic analysis of speech signal. What are the typical values of parameters (e.g. window duration, FFT length, and window shift) for wideband and narrowband spectrograms? Give the reasoning for the same. **7**
   (b) With the help of neat block diagram, explain the working of clipping auto correlator. What are the advantages of using three level clipper? **8**
   (c) Explain the US federal standard 1016 using CELP. **5**

4 (a) Draw a diagram of the vowel triangle, giving the approximate positions of the basic English vowels. **5**

(b) Explain various possible information rates for speech signal with reference to its parametric and waveform representation. **5**

(c) Explain Levinson-Durbin algorithm for calculation of prediction coefficients. **10**

5. (a) Explain the production of English vowels and diphthongs. **5**

(b) What is MFCC? Explain the method to calculate MFCC using block diagram. **5**

(c) What is multi-pulse excitation? How is the multi-pulse excitation superior to the CELP coder? **10**

6. (a) Draw a diagram of a lattice structure for an all-pole filter and explain it. **5**

(b) What are the problems with speech recognition system? **5**

(c) Explain an LPC based synthesizer using a block schematic. What is the assumption used in the synthesis? **10**