

Total No. of Questions : 10]

SEAT No. :

**P4940**

[Total No. of Pages :3

**[4959]-1094**  
**B.E. (E & TC)**  
**SPEECH AND AUDIO SIGNAL PROCESSING**  
**(2012 Pattern)**

*Time : 2 ½ Hours]*

*[Maximum Marks : 70*

*Instructions to the candidates:*

- 1) *Q.1, OR Q.2, Q.3 OR Q.4 , Q.5.OR Q.6, Q.7 OR Q.8, Q.9 OR Q.10.*
- 2) *Right side figures indicate marks*
- 3) *Assume suitable data, if necessary.*

- Q1)** a) Explain in detail autocorrelation method for computing Linear Predictor Coefficients **[6]**
- b) What is Pitch of speech signal? Explain any one method for computation of pitch of the speech signal? **[4]**

OR

- Q2)** a) Explain LTI model of speech production. **[5]**
- b) Explain the concept of critical band and auditory systems as a filter bank? **[5]**
- Q3)** a) What is spectrogram? What are their types? Explain its significance and applications in speech processing **[5]**
- b) Explain the concept of **[5]**
- i) Spectral flux.
  - ii) Spectral roll-off

OR

**P.T.O.**

- Q4)** a) How Short time energy, short time average magnitude short time average zero crossing rate is useful in speech processing? [4]
- b) Explain the concept of [6]
- i) Spectral Centroid
  - ii) Spectral spread
  - iii) spectral entropy

- Q5)** a) Explain basic principal of Linear Predictive Analysis? Explain autocorrelation method for formant analysis [8]
- b) Explain the Covariance method for computing Linear Predictor Coefficients. [8]

OR

- Q6)** a) Explain covariance method for Linear Predictive Analysis? [8]
- b) Explain Durbin algorithm in LPC analysis. [8]

- Q7)** a) What is homomorphic processing? with reference to speech processing. How it is useful for speech analysis.? [8]
- b) Explain in detail estimation of formant and pitch parameters using cepstrum [8]

OR

- Q8)** a) What is cepstrum? Explain in detail computation of Mel Frequency Cepstral Coefficients (MFCC). [8]
- b) What is long term complex cepstrum? What is short term complex cepstrum? Explain the properties of the complex cepstrum. [8]

- Q9)** a) Explain in detail automatic speech recognition system with suitable example (e.g. automatic telephone dialling system) [9]
- b) What is the difference between speaker identification and speaker verification? What are the features used for speaker recognition/verification system and how? [9]

OR

- Q10)**a) What is dynamic time warping? Explain with suitable example. [4]
- b) Explain speech enhancement using comb filter and spectral subtraction method. [10]
- c) What are the various methods used for TTS. [4]

