

Total No. of Questions : 12]

SEAT No. :

**P841**

**[4659]-100**

[Total No. of Pages : 2

**B.E. (E & T/C)**

**b - SPEECH PROCESSING**

**(2008 Pattern) (Semester - II) (Elective - III)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Answer three questions from Section - I and three questions from Section - II.*
- 2) *Answer to the two sections should be written in separate books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Assume suitable data, if necessary.*

**SECTION - I**

- Q1)** a) Describe the LTI and LTV model of speech production. [8]  
b) Explain in detail, the classification of speech signal with respect to American English. [8]

OR

- Q2)** a) Explain the following classes of speech signal with suitable examples. [8]  
i) Affricates  
ii) Fricative  
iii) Semivowels  
iv) Diphthongs  
b) Explain pitch period estimation using a parallel processing approach. [8]

- Q3)** a) Obtain the direct form I filter coefficients from the following reflection coefficients  $k_1 = -0.5878$   $k_2 = 0.4123$   $k_3 = -0.312$  [8]  
b) Write a note on selection of order of linear predictor filter. [8]

OR

- Q4)** a) What is the difference autocorrelation method. Explain covariance method used to minimize mean square error over a fixed interval. [8]  
b) Explain Burg's algorithm based on Lattice method. [8]

- Q5)** a) Write a note on Mel scale and bark scale. [9]  
b) With the help of neat block diagram, explain the computational procedure for calculation of Mel Frequency Cepstral Coefficients. [9]

OR

**P.T.O.**

- Q6)** a) Explain autoregressive modelling for spectral smoothing. [9]  
 b) Write short note on short time speech analysis. [9]

**SECTION - II**

- Q7)** a) What is speech enhancement and explain different speech enhancement techniques in detail. [8]  
 b) Write note on different interfacing noises. [8]

OR

- Q8)** a) Explain spectral subtraction method with block diagram. [8]  
 b) Explain with the help of block diagram STSA method. [8]

- Q9)** a) Explain the various conditions that are used for the optimization of dynamic time warping algorithm. [8]  
 b) Explain HMM for speech recognition with state diagram. [8]

OR

- Q10)** a) Explain with block schematic continuous digit recognition system. [8]  
 b) From the given transition matrix draw the state diagram. [8]

$$\begin{bmatrix} 0.3 & 0.5 & 0.1 & 0 & 0.1 \\ 0.2 & 0.4 & 0.4 & 0 & 0 \\ 0 & 0.1 & 0.3 & 0.5 & 0.1 \\ 0 & 0.1 & 0.1 & 0.5 & 0.3 \\ 0.2 & 0 & 0 & 0.2 & 0.6 \end{bmatrix}$$

- Q11)** a) Distinguish between speaker identification and speaker verification. [9]  
 b) Explain with block diagram text-to-speech synthesis system. [9]

OR

- Q12)** a) With the help of block schematic explain formant-based synthesizer. [9]  
 b) Explain Unit selection synthesis related to concatenative synthesis. [9]

