Printed Pages: 02   **Sub Code: NEC043**

Paper Id: | 131823 | **Roll No.**

B. TECH
(SEM VIII) THEORY EXAMINATION 2017-18
SPEECH PROCESSING

Time: 3 Hours   *Total Marks: 100*

Note: 1. Attempt all Sections.
2. If require any missing data; then choose suitably.

SECTION A

1.   **Attempt *all* questions in brief.**   **2 x10 = 20**

a. What is a phoneme?
b. Define a speech signal?
c. Define short time energy and zero crossing rate.
d. What is AMDF?
e. Define pitch detection.
f. What are vocoders?
g. Explain homomorphic system.
h. Explain the concept of complex cepstrum of speech.
i. Write the basic principle of linear predictive coding of speech.
j. Differentiate between convolution and deconvolution of speech.

SECTION B

2.   **Attempt any *three* of the following:**   **10 x 3 = 30**

(a) With a schematic diagram of vocal apparatus, explain the mechanism of speech production and identify the source system components. Also explain the classification of speech sound according to mode of excitation.

(b) With the help of block diagram explain the operation of the simple pitch period estimators. Also list the limitations of short time zero crossing detector.

(c) Explain the linear filter operation of a short time spectrum analysis with the help of a block diagram. Also discuss the magnitude of the short time spectrum using both low pass filter and band pass filter.

(d) Write the properties of complex cepstrum of a stable sequence. Also explain the homomorphic system for convolution with the help of a block diagram.

(e) Discuss the significance of LPC in speech synthesis system. Also derive an expression for linear predictor coefficients.

SECTION C

3.   **Attempt any *one* part of the following:**   **10 x 1 = 10**

(a) What are the different types of phonemes in American English? Explain with at least one example in each case.

(b) Define nasals. How they are produced? What are the reasons for broadening of nasal resonances?

4.   **Attempt any *one* part of the following:**   **10 x 1 = 10**

     (a) With the help of a block diagram and mathematical analysis explain how short time energy and average magnitude of speech signal is computed.

     (b) What are the factors which have to be considered in automatic recognition of isolation during speech versus silence discrimination? Elaborate with two examples.

5.   **Attempt any *one* part of the following:**   **10 x 1 = 10**

     (a) Describe filter bank summation method of short time synthesis in signal in terms of linear filtering.

     (b) Define short time Fourier transform. Also explain the Fourier transform interpretation of short time Fourier transform.

6.   **Attempt any *one* part of the following:**   **10 x 1 = 10**

     (a)With the help of a block diagram explain homomorphic vocoder containing analyzer and synthesizer.

     (b) Explain parallel processing time domain pitch detection. Also explain homomorphic deconvolution of speech signal.

7.   **Attempt any *one* part of the following:**   **10 x 1 = 10**

     (a) Discuss the frequency domain interpretation of mean squared prediction error of a loss less tube model. Also describe the relations between various speech parameters.

     (b) Write notes on the following

      (i) Normalized mean square error

      (ii) Applications of LPC parameters

      (iii) Linear predictive coding