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Paper Id: 231766 **Roll No.** | | | | | | | | | | |

B. TECH.
(SEM VII) THEORY EXAMINATION 2022-23
SPEECH PROCESSING

Time: 3 Hours ***Total Marks: 100***

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

SECTION A

1. Attempt *all* questions in brief. 2 x 10 = 20

(a) Define a speech signal.
(b) What are lossless tube models of speech signal?
(c) Write short note on speech spectrogram.
(d) What is short time average zero crossing rate?
(e) Define pitch detection.
(f) Define correlation function with an example.
(g) What do you understand by filter? Explain.
(h) Write the basic principle of linear predictive coding of speech.
(i) Explain the concept of complex cepstrum of speech.
(j) Differentiate between convolution and deconvolution of speech.

SECTION B

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

(a) Explain in detail the mechanics of speech production and acoustic phonics.
(b) With the help of a block diagram and mathematical analysis explain how short time energy and average magnitude of speech signal is computed.
(c) What is short-time Fourier analysis? Explain the properties of short-time Fourier analysis.
(d) What is homomorphic system of convolution? Explain in detail.
(e) Discuss the frequency domain interpretation of mean squared prediction error of a lossless tube model. Also describe the relations between various speech parameters.

SECTION C

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

(a) Explain digital models for speech signals using examples.
(b) Why we need speech processing in real world? Explain with example

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

(a) What is pitch period estimation using parallel processing? Explain with proper equations.
(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) What is vocoder and channel vocoder? Explain with proper diagrams.

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

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

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

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

(a) Multipulse LPC uses an excitation with several pulses per pitch period.Explain how this can improve LPC quality.

(b) How do we compute the gain for a given model? Explain.