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10EC756

Seventh Semester B.E. Degree Examination, Dec.2013/Jan.2014
Speech Processing

Time: 3 hrs. Max. Marks:100

Note: ***Answer FIVE full questions, selecting at least TWO questions from each part.***

PART – A

1 a. With a schematic, describe the speech production mechanism and identify the source system components. Also explain the classification of speech sound according to mode of excitation. **(12 Marks)**

b. What is a phoneme? Explain in detail, the vowels, semi vowels, Dipthongs and Nasals. **(08 Marks)**

2 a. With a related block diagram, equations explain how short time energy and average magnitude of speech signal is computed. **(12 Marks)**

b. With the related equations, block diagram explain short time average zero crossing rate in detail. Also list the limitation of short-time-zero crossing detector. **(08 Marks)**

3 a. Explain the operation of pitch period estimation using parallel processing approach. With a related block diagram and graph. **(10 Marks)**

b. From the basic equation for autocorrelation function of a discrete-time deterministic signal $\phi(K)$, derive the equation for short time auto correlation function $R_n(K)$. Draw the related block diagram so as to obtain $R_n(K)$ from the sequence X(n). Also discuss modified auto correlation function with their window condition. **(10 Marks)**

4 a. With respect to temporal processing of speech signal. Explain the following :
(i) Temporal filtering.
(ii) Non-linear transformation of time-trajectories. **(10 Marks)**

b. What is RASTA processing? Explain with related block diagram and equations. Also draw the frequency response of the RASTA band pass filter. **(10 Marks)**

PART – B

5 a. Define short-time Fourier transform. Also explain the Fourier transform interpretation of short-time-Fourier-transform (STFT). **(10 Marks)**

b. Explain the linear filter operation of a short-time spectrum analysis with related equations and block diagram. Also discuss about magnitude of the short time spectrum using both low pass filters and band pass filter. **(10 Marks)**

6 a. Explain filter bank summation method of short time synthesis in signal in terms of linear filtering. **(10 Marks)**

b. Explain overlap addition method for short time synthesis. **(10 Marks)**

7 a. Explain the homomorphic system for convolution with related equation and block diagram. **(10 Marks)**

b. With a related block diagram, explain homomorphic vocoder containing an analyzer and synthesizer. **(10 Marks)**

8 a. Write a short note on voice response system. Also explain with a block diagram of an all digital voice response system. **(10 Marks)**

b. Write a short note on on-line digital speaker verification system. Also explain with a block diagram of the signal processing aspects of the speaker verification system. **(10 Marks)**

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