Reg. No.

MANIPAL INSTITUTE OF TECHNOLOGY

(A constituent unit of MAHE, Manipal)

SEVENTH SEMESTER B.TECH. (E & C) DEGREE END SEMESTER EXAMINATION NOVEMBER 2018 SUBJECT: DIGITAL SPEECH PROCESSING (ECE - 4007)

TIME: 3 HOURS

MAX. MARKS: 50

Instructions to candidates

- Answer **ALL** questions.
- Missing data may be suitably assumed.
- 1A. Describe a simple digital source model that can best approximate human speech production system. Illustrate two possible system functions for vocal tract filter.
- 1B. Explain the significance of short time analysis in speech signal processing. Define and explain the following short time parameters of speech.
 - i) Energy ii) Average magnitude function iii) Zero crossing rate iv) Autocorrelation

2A. Describe an algorithm for speech vs silence discrimination using short time parameters of speech.

2B. Explain formant analysis using spectrum of speech signal. Illustrate with suitable spectral plots.

(5+5)

(5+5)

- 3A. With mathematical analysis describe homomorphic filtering of speech for glottal source estimation.
- 3B. With mathematical analysis, explain auto correlation based Linear prediction analysis of speech.

(5+5)

- 4A. What is inverse filtering in LP analysis of speech? Describe Simple Inverse Filtering Tracking (SIFT) algorithm for pitch tracking.
- 4B. Highlight the main problem with LPC vocoder. Describe Voice Excited LPC vocoder for low bit rate coding of speech.

(5+5)

- 5A. Explain the concept of sub band coding of speech. Speech signal band limited to 3.4 KHz and sampled at 8 KHz is coded with 4 sub bands 0-425Hz, 425-850Hz, 850-1700Hz and 1700-3400Hz. 4 bits are used to encode first two bands and 2 bits for the last two bands. Draw the frequency response of the filter bank and estimate the bit rate of the coded speech.
- 5B. Describe the principle and working of channel vocoder.

(5+5)