MANIPAL INSTITUTE OF TECHNOLOGY

(A constituent unit of MAHE, Manipal)

SIXTH SEMESTER B.TECH. (E & C) DEGREE END SEMESTER EXAMINATION JUNE 2019

SUBJECT: ADVANCED DIGITAL SIGNAL PROCESSING (ECE - 4005)

TIME: 3 HOURS

Instructions to candidatesAnswer ALL questions.

- Missing data may be suitably assumed.
- 1A. Discuss the operation of decimation and interpolation in Multirate systems. Also characterise them in transform domain.
- 1B. Explain the following Multirate system applications
 - i. Transmultiplexer ii. Digital Audio System

(6+4)

MAX. MARKS: 50

- 2A. What is polyphase decomposition in Multirate systems? Explain in detail. Discuss the computational efficiency achieved in decimation and interpolation operation.
- 2B. Prove that analysis and synthesis filters of DFT filter bank form a perfect reconstruction system.

(6+4)

- 3A. Define Short Time Fourier Transform (STFT). From the basic definition, derive the filter bank representation of STFT.
- 3B. Draw the 3-level binary tree structured QMF bank and its equivalent 4-channel system for the implementation of DWT. Mention the transfer functions of filters used for this purpose.

(6+4)

4A. With the relevant mathematical expressions and waveform explain the working of adaptive side lobe canceller.

4B. A signal is transmitted in a communication channel having unknown transfer function and corrupted by AWGN. Propose a method using adaptive filers to recover the transmitted signal. (5+5)

- 5A. Define complex cepstrum of a signal. Derive expression for cepstrum of exponential signals.
- 5B. Explain the homomorphic system of multiplication using an example from Digital Image Processing.

(5+5)