Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

(A constituent unit of MAHE, Manipal)

FOURTH SEMESTER B.TECH. (E & C) DEGREE END SEMESTER EXAMINATION
JUNE 2019
SUBJECT: DIGITAL SIGNAL PROCESSING (ECE - 2203)

TIME: 3 HOURS **MAX. MARKS: 50**

Instructions to candidates

- Answer **ALL** questions.
- Missing data may be suitably assumed.

1A. An input x(n)= [1, -3.5, 1.5] is given to a stable system. The output y(n)=[3, -4]. Determine the impulse response of the system using Z transform.

1B. i) Given two signals a(n) and b(n) with corresponding 4-point DFTs A(k)={6, 0, 2, 0} and B(k)={6,0,-4,0}. If c(n) is the circularly convoluted output of a(n) and b(n), determine c(n).
ii) Explain overlap and save method for filtering long data sequences.

(5+5)

2A. Deduce DIF FFT algorithm and illustrate it with signal flow diagram.

2B. A length 9 linear phase digital FIR filter is required with pass band extending from 300Hz to 600Hz at a sampling frequency of 4.8kHz. The filter should have an attenuation of at least 50 dB in the stop band. Determine the filter coefficients using suitable window function. Also write down the system function H(z).

(5+5)

3A. Explain Type-1 Chebyshev low pass IIR filter design to determine the order and poles of the analog filter.

3B. Obtain the transfer function of first order analog prototype low pass filter. Convert this into LPF and HPF with 3 dB frequency Ω_c = 2 radians/sec. Also obtain the system function of the above LPF using impulse invariant transformation technique at a sampling frequency of 1Hz.

(5+5)

4A. Obtain the system function for frequency sampling realization of FIR filter with impulse response h(n). Sketch the realization structures for both even and odd length filters.

4B. Determine the lattice and ladder parameters for the following IIR filter. Sketch the lattice-ladder structure.

$$H(z) = \frac{1 - 0.8z^{-1} + 0.15z^{-2}}{1 + 0.12z^{-1} - 0.72z^{-2}}$$

(5+5)

5A. Describe the general cascade realization for IIR filters. Sketch the direct form-II realization of standard second order section.

5B. Highlight the estimation of PSD using autocorrelation function. Briefly explain one such method of PSD estimation.

5C. Bring out the advantages of parametric method of PSD estimation. Mention different methods of signal modelling used. (3+4+3)