Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY
Manipal University

SIXTH SEMESTER B.Tech. (I & CE) DEGREE END SEMESTER EXAMINATION
May/June 2016
SUBJECT: DIGITAL SIGNAL PROCESSING (ICE - 306)

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

Instructions to candidates
- Answer **ANY FIVE** full questions.
- Missing data may be suitably assumed.

1A. Determine even and odd part of signal x(n) = {2,-2,6,-2}.

1B. Define any four types of discrete time systems with an example for each.

1C. Test the following systems for linearity.
i) y(n)=x(n)-2x(n-1) ii) $y(n)=nx^2(n)$.

(2+4+4)

2A. Determine the convolution sum of two sequences x(n)={3,2,1,2} and h(n)={1,2,1,2}.

2B. Find the output y(n) of a filter whose impulse response is h(n)={1,1,1} and input signal x(n)={3,-1,0,1,3,2,0,1,2,1} using overlap-add method.

2C. Test the stability of LTI system with $h(n) = 0.3^n u(n)+2^n u(n)$.

(3+5+2)

3A. State and explain the following properties of z-transform,
i) Time reversal ii) Convolution theorem.

3B. Determine the inverse z-transform of

$$X(Z) = \frac{1}{1 - 0.8z^{-1} + 0.12z^{-2}} \qquad if\ ROC\ is, |z| > 0.6$$

3C. Compute the 4-point DFT of the sequence x(n)={0,1,2,3}. Sketch the magnitude and phase spectrum.

(2+4+4)

4A. An 8-point sequence is given by x(n)={2,2,2,2,1,1,1,1}. Compute 8-point DFT of x(n) using radix-2 DIT FFT.

4B Bring out the difference between analog and digital filters.

4C Briefly explain the impulse invariant and bilinear transformation.

(5+2+3)

5A. Design the Butterworth IIR lowpass filter using bilinear transformation by taking T=0.1sec, to satisfy the following specification.

$0.6 \le |H(e^{j\omega})| \le 1.0 \ ; for\ 0 \le \omega \le 0.35\pi$

$|H(e^{j\omega})| \le 0.1 \ ; for\ 0.7\pi \le \omega \le \pi$

5B. Obtain the direct form I and direct form II realization for following system

$$H(Z) = \frac{1 - a\cos\omega_0 z^{-1}}{1 - 2a\cos\omega_0 z^{-1} + a^2 z^{-2}}$$

(6+4)

6A. Design the linear phase FIR lowpass filter using rectangular window by taking 7 samples of window sequence and with a cutoff frequency of $\omega_c=0.2\pi$ rad/sample.

6B. Write a short note on i) Biomedical signal processing ii) Histogram equalization

(5+5)

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