



R - 1007

Seat No. []

T.E. (Electrical Engg.) (Semester - V) Examination, 2009
DIGITAL SIGNAL PROCESSING (New)

Day and Date: Saturday, 5-12-2009
Time: 10.30 a.m. to 1.30 p.m.

Max. Marks: 100

Note : Attempt any three questions from each Section.

SECTION--I

1. a) Determine the response of the system defined by :

$$y(n) = \frac{5}{6}y((n-1)) - \frac{1}{6}y(n-2) + x(n)$$
 to the input signal

$$x(n) = \delta(n) - \frac{1}{3}\delta(n-1)$$
 where $\delta(n)$ is the impulse signal. 8
- b) Derive the condition of the stability for system and check the stability property of system described as 8

$$y(n) = e^{-X(n)}$$
2. a) Derive the relation between DFT and Z-transform for N-point sequence. 8
- b) If $X_1(n) = [1, 2, 1, 2]$ and $X_2(n) = [2, 1, 2, 1]$ obtain the circular convolution using DFT - IDFT property. 8
3. a) How computation time is reduced in case of fast fourier algorithms ? Show that for N-pointing DFT equation how it reduced down for multiplication and for addition ? 8
- b) Explain in detail the process of decimation of signal $X(n)$ by a factor M. 8
4. a) Using DIT-FFT algorithm explain the signal flow graph for 8-point DFT sequence and solve for 8-point DFT using DIT FFT if $X(n) = [1, 2, 3, 4, 3, 2, 1, 0]$. 10
- b) Explain the requirement of changing sampling rate and comment on the benefits of up sampling and down sampling. 8

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SECTION – II

5. a) Obtain the direct form II, cascade and parallel realization of:

$$H(z) = \frac{1 + \frac{1}{4}z^{-1}}{\left(1 + \frac{1}{2}z^{-1}\right)\left(1 + \frac{1}{2}z^{-1} + \frac{1}{4}z^{-2}\right)} \quad 10$$

- b) Explain with block diagram the architecture of DSP TMS 320 controller. 8
6. a) Design a second order Band Pass Butterworth filter that meets following specifications :
 Lower cut off frequency = 210 Hz
 Upper cut off frequency = 330 Hz
 Sampling frequency = 960 sps.
 Also realize the resulting filter structure in direct form I. 8
- b) Explain quantization error in Rounding and truncation. 8
7. a) Design an FIR low pass filter for the specifications given as :
 $H_d(f) = 1$ for $0 \leq f \leq 5$ Hz
 $= 0$ Elsewhere
 The sampling frequency is 20 sps and the impulse response is to have duration of 1 sec. 8
- b) What is window function ? Explain the need of windowing and different window functions used. 8
8. a) Explain effect of finite word length on the stability and frequency response of digital filters. 8
- b) Design a Digital filter using Bilinear transformation method if

$$M(s) = \frac{5s + 1}{s^2 + 0.4s + 1}$$
 and the cutoff frequency is 10 Hz with the sampling frequency of 60 Hz. 8