B.E. Sem 7 (Rev.) Comp. Digital Signal Processing 04/12/08.

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Con. 5403–08. (REVISED COURSE) RC–7253

(3 Hours) [Total Marks : 100

N.B. : (1) Question No. **1** is **compulsory**.
(2) Attempt any **four** questions from the remaining **five** questions.

1. (a) Derive the relationship between 2 transform, DTFT and DFT. 5
   (b) Find the step response of a system having difference equation. 5
   $y(n) = x(n) - 0{\cdot}4\ y(n-1) + 0{\cdot}05\ y(n-2)$
   (c) Show that if x(n) is odd signal then $\sum_{n=-\infty}^{\infty} x(n) = 0$ 5
   (d) Determine wheather following signals are periodic 5
   (i) $\cos(0{\cdot}3\ \pi n + \pi/6)$ (ii) $x(n) = \sin(0{\cdot}01\ \pi n)$

2. (a) Using DIF–FFT find DFT of the following sequence 10
   $x(n) = \{1, 3, -2, 4, 1, 4, -2, 3\}$
   (b) Find the z transform of the following sequence and specify the ROC : 10
   (i) $x(n) = n\left(\frac{1}{4}\right)^n u(n)$ (ii) $x(n) = n\ u(-n-1)$

3. (a) Find initial and final value of x(n) for following causal system : 5
   (i) $x(z) = \frac{2z^2 + 1}{z^2 - 0{\cdot}5z - 0{\cdot}5}$ (ii) $x(z) = \frac{z}{z^2 + z - 1}$
   (b) Sketch the pole-zero plot for the system with transfer function : 5
   $H(z) = \frac{z^6 - 2^6}{z^5\,(z-2)}$ it the system stable.
   (c) Find the convolution and correlation of two sequences $x_1(n)$ and $x_2(n)$ 10
   $x_1(n) = [2, 1, 3]$ $x_2(n) = [-2, -1, 1]$

4. (a) Design a digital Butterworth filter satisfying the following constraints using bilinear transformation 10
   Assume T = 1S
   $0{\cdot}9 \le |H(e^{jw})| \le 1 \quad 0 \le w \le \pi/2$
   $|H(e^{jw})| \le 0{\cdot}2 \quad 3\pi/4 \le w \le \pi$
   (b) What is discrete hilbert transform ? Why it is used. 5
   (c) What are the conditions to be satisfied by LTI system. 5

5. (a) A low pass filter has desired response as given below **10**

$$H_d(e^{jw}) = \begin{matrix} e^{-j3w} & 0 \le w \le \pi/2 \\ 0 & \pi/2 \le w \le \pi \end{matrix}$$

Determine the filter coefficient h(n) for M = 7 using frequency sampling technique.

(b) Impulse response of LTI system is h(n) = {1 $\underset{\uparrow}{2}$ –1 3} **10**

Determine the output response of the system to input x(n) = {$\underset{\uparrow}{1}$ 2, 3, 1}

6. Write short notes on :– **20**
   (a) Application of DSP in Telecommunication
   (b) DSP processors
   (c) Fetal ECG monitoring
   (d) Chirp 2 Algorithm.
