ws May-2012 37
Con. 4731-12. GN-9224

(3 Hours) [Total Marks : 100

N.B. : (1) Question No. **1** is **compulsory.**
(2) Attempt any **four** questions out of remaining **six** questions.
(3) Assume **sutiable** data if **necessary** and **clearly** state it.

1. Solve any **four** of the following :– **20**
   (a) Show that a unit ramp signal is neither energy nor a power signal.
   (b) Obtain $y(n) = x(n) * h(n)$
   $x(n) = 3\delta(n+2) - 2\delta(n+1) + \delta(n) - \delta(n-1)$
   $h(n) = 4u(n) - 2u(n-2) - u(n-3) - u(n-4)$.
   (c) Find Z-Transform of $x(n) = (n+1)\, a^n\, u(-n-1)$ Specify ROC.
   (d) Obtain 4–point DFT of the signal $x(n) = \cos\left(\frac{n\pi}{2}\right)$
   (e) Prove initial value theorem of Z – Transform.

2. (a) Obtain zero state response, zero input response and total response of the system. **10**
   $y(n) - 0{\cdot}5\, y(n-1) = 2(0{\cdot}2s)^n\, u(n)$ with initial condition $y(-1) = -2$.
   (b) Find DFT of the folloiwng sequence $x(n) = \{1+3j,\ 2-2j,\ 2,\ 3+j\}$ **10**
   From above result find DFT of the following sequences.
   $x_1(n) = \{1, 2, 2, 3\}$
   $x_2(n) = \{3, -2, 0, 1\}$.

3. (a) Given $x(n) = n + 1 \quad 0 \le n \le 7$. Find 8-point DFT using DIF-FFT algorithm. **10**
   (b) Determine inverse Z-Transform for all possible ROC condtions. **10**

$$X(2) = \frac{z\left[2z^2 + 3z - 7\right]}{(z+2)\,(z-4)\,(z-6)}$$

4. (a) Design a linear phase high pass FIR filter of 6th order with cut-off frequency **10**
   $w_c \frac{\pi}{2}$ using hamming window.
   (b) Design a digital low pass Butterworth filter for following specifications. **10**
   Pass band attenuation = 0·9
   Slop band attenuation = 0·15
   Pass band frequency = 0·3π
   Slop band frequency = 0·7sπ
   Sampling frequency = 10 kHz.
   Use bilinear transformation method.

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5. (a) Draw the structures of cascade and parallel realisations of – 10

$$H(z) = \frac{(1-z^{-1})^3}{\left(1-\frac{1}{2}z^{-1}\right)\left(1-\frac{1}{8}z^{-1}\right)}$$

(b) Obtain y(n) from
$x(n) = (1, 3, 2)$
$h(n) = (4, -5)$
Using DFT/IDFT algorithm. 10

6. (a) Determine and sketch the magnitude and phase response of –
$y(n) = 0{\cdot}5\ [x(n) + x(n-2)]$ 10
(b) Derive the Radix 2 DIT – FFT for a 8-point DFT. 10

7. Write short notes on any **four** :– 20
(a) Application of DSP in biomedical Engg.
(b) Prove Convolution property of Z-Transform.
(c) Classification of Systems.
(d) Overlap – Add and Overlap Save Methods.
(e) Compare FIR and IIR Filters.