QP Code : 13490

(3 Hours) [Total Marks : 80

N.B. : (1) Question No. 1 is **compulsory**.
(2) Attemt any **three** questions from the remaining **five** questions.
(3) Assume **suitable** data if **necessary**.

1. Answer the following any **four** :– 20
   (a) Find the Z-transform of
   (i) $x(n) = a^n u(n)$
   (ii) $x(n) = -u(-n-1)$
   also specify the ROC.
   (b) For analog transfer function
   $Ha(s) = \frac{3}{(s+1)(s+2)}$ Determine H(z) using impulse invarient method assume T = 2sec
   (c) If x(k) = {8, -2-2j,0, -2+2j} find the IDFT.
   (d) Difference b/w Linear and circular convolution.
   (e) Define sampling theorm. What are the advantages DSP.

2. (a) Find the DFT of x(n) = [1 1 2 3] using the above result and not otherwise find the DFT of 10
   $x_1(n) = \{1, 0, 1, 0, 2, 0, 3, 0\}$
   $x_2(n) = \{1, 0, 0, 1, 0, 0, 2, 0, 0, 3, 0, 0\}$
   $x_3(n) = [1, 1, 2, 3, 1, 1, 2, 3]$
   (b) x(n) = {2, 2, 2, 2, 1, 1, 1, 1} compute 8 point DFT with Radix-2 DIT FFT algorithm. 10

3. (a) The input sequence x(n) = [1, 1, 2, -1, 2, -3, -1, 1, 2, 1, -3, -1] having the impulse response of FIR filter h(n) = {2, 3, 4} using overlap save method find o/p response. 10
   (b) Determine the frequency response of the system y(n) = 0.9y (n-2) +0.2 x(n). Find magnitude and phase response of it. 10

4. (a) Realize the systme using D.F. II, cascade and parallel realization 5
   $y(n) = x(n) + \frac{1}{4}x(n-1) + \frac{1}{6}y(n-1) + \frac{1}{6}y(n-2)$
   (b) $H(e^{jw}) = e^{-j3w}\left[0.5 + 2.2\cos 3w\right] + \left[1.2\cos 2w + 0.4\cos w\right]$ obtain order and impulse response of s/m. 5
   (c) Write a short note on comb filter and notch filter. 10

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5. (a) Design a digital Butterworth fiture that satisfy the following constraints using Bilinear transformation. 10

Assume T = 1 sec

$$0.9 \leq H\left(e^{jw}\right) \leq 1 \qquad 0 \leq w \leq 0.25\pi$$

$$H\left(e^{jw}\right) \leq 0.2 \qquad 0.6\pi \leq w \leq \pi$$

(b) A linear phase FIR filure has desired response 10

$$H_d\left(e^{jw}\right) = 0 \text{ for } -3\pi/4 \leq w \leq 3\pi/4$$

$$= e^{-j2w} \text{ for } 3\pi/4 < |w| \leq \pi$$

Design the filter using Hamming window also draw linear phase realization.

6. (a) Write a short note on 'Decimation by integer factors'. 5

(b) Explain the application of DSP processor (Texas-320). 10

(c) If the order of filter N = 2 find the transfer function at IIR filter (poles of IIR filter). 5
