29/5/15 L (1) (16) Biomedical/Digital Signal processing T-E- Bm/V/CBGS/BDSP

QP Code : 3355

(3 Hours) [Total Marks :80

N.B. : (1) Question No.1 is **compulsory.**
(2) Assume any **three** questions form remaining **five** questions.
(3) Assume any data if necessary. Mention clearly the same

1. (a) Check whether the following signals are Energy or Power signals. 4

(i) $x(n)=\left(\frac{1}{3}\right)^{n} u(n)$

(ii) $x(n)=\sin\left(\frac{\pi}{9}n\right)$

(b) Determine if the following systems are time invariant 4

(i) $y(n)=x\left(\frac{n}{2}\right)$

(ii) $y(n)=nx^{2}(n)$

(c) Find the relationship between the Z-transform and DTFT 4

(d) Prove the linearity property of the DFT 4

(e) Find the Fourier Transform of 4

$$x(n)=\left(\frac{1}{2}\right)^{|n|}$$

2. (a) Compute the Z-transform of the signal 4

$x(n)=\{1, 2, 3, \underset{\uparrow}{4}, 5, 6\}$ specify the ROC

(b) Compute x(n) if 8

$$x(z)=\frac{1+3z^{-1}}{1+3z^{-1}+2z^{-2}} \quad |z|>2$$

(c) Prove the convolution property of the Z-transform 8

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3. (a) Realize the system given by

$$H(z) = \frac{1 - z^{-1}}{1 - 0.2^{-1} - 0.15z^{-2}}$$

using:

(i) Cascade form

(ii) Parallel form 10

(b) Determine linear convolution of $x(n) = \{1, 5, \underset{\uparrow}{6}, 2, 3\}$, $h(n) = \{-1, \underset{\uparrow}{1}, 1\}$ 5

(c) Perform circular convolution of $x_1(n) = \{1, 4, 6, 8\}$, $x_2(n) = \{3, 5, 7\}$ 5

4. (a) Develop a 8-point DIT-FFT algorithm and Draw the Buttorfly diagram 10

(b) Given the DFT, compute the IDFT using the DIT-FFT 6

$X(k) = \{10, -2 + 2j, -2, -2 - 2j\}$

(c) What are the number of Multiplications required to compute a N-point DFT and how many Multiplications are required if the same is computed using the FFT algorithm 4

5. (a) Find the output y(n) of a filter whose impulse response is $h(n) = \{1, 1, 1\}$ and input signal is $x(n) = \{3, 2, 4, -1, 0, 6, 2, 3, -1, -2\}$ use overlap and add method 10

(b) By means of DFT, IDFT method only determine $x_3(n) = x_1(n) \otimes x_2(n)$ where $x_1(n) = \{1, 2, 3, 4\}$, $x_2(n) = \{1, 1, 2, 2\}$ 5

(c) Explain any one Application of DSP in Biomedical engineering 5

6. (a) A low pass FIR filter is to be designed with the following specification 10

$H(e^{j\omega}) = 1 \quad -0.3\pi \le |\omega| \le 0.3\pi$

$= 0 \quad$ otherwise

Use a rectangular window of length $N = 6$

(b) Determine H(Z) using impulse invariance technique if the analog filter function is given by $H(S) = \frac{1}{s^2 + 3s + 2}$ $T = 1$ sec. 5

(c) compare FIR and IIR filters 5
