Biomedical T.E. sem-V (CBSGS) 27/05/16

'Biomedical Digital Signal Processing'

QP Code : 31181

(3 Hours) **[Total Marks : 80**

N. B. : (1) Question No. **1** is **compulsory**.
(2) Answer any **three** from remaining **five** questions.
(3) Assume any data if need, justify it.

1. (a) Let x(n) = (1,2,3,–1), h[n] = (1,1,–1) find y[n] = x(n) * h[n] using Z-transform properties only **muADDA.com** 5
   (b) Prove the time shifting property of DFT 5
   (c) Let x[n] = (1,2,3) find, 3-point DFT of the sequence 5
   (d) Convert the analog filter with system function $H(s) = \frac{1}{s^2 + 5s + 6}$ into a digital filter using impulse invariant method, T_s = 1 sec. 5

2. (a) Determine x(n) if $X(z) = \log(1 + az^{-1})$; $|z| > |a|$ 5
   (b) Find DT FT of the signal 5
   $x[n] = 1 \quad 0 \le n \le 4$
   $= 0$ else where
   (c) Find x(n) if $X(z) = \frac{1}{1 + \frac{1}{6}z^{-1} - \frac{1}{6}z^{-2}}$ if the signal is right sided. 5
   (d) If x[n] = (1,2,3,4), h[n] = (1,1,1) find the circular convolution of x[n]and h(n) 5

3. (a) Find x[n] if X(k) = (10,–2+j2,–2,–2–j2) using IDFT radix –2, FFT algorithm. Draw the flow graph. 5
   (b) Prove the frequency shifting property of DFT 5
   (c) Find X(k) using radix-2, DITFFT algorithm for finding DFT of the sequence x(n) = (0,1,2,3,4,5,6,7) draw the flow graph. 10

4. (a) Explain overlap add-method and overlap save method of linear filtering of long data sequence, with proper example. 10
   (b) Develope the radix -2, DIFFFT algorithm for finding the 8-point DFT, draw the flow graph. **muADDA.com** 10

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5. (a) Design an FIR filter satisfying the following specification 10

$H_d(e^{j\omega}) = e^{-j2\omega} \quad -\pi/4 \le \omega \le \pi/4$

$= 0 \quad \pi/4 < |\omega| \le \pi$

Determine the filter co-efficient if the window function is Hamming window; assume the length of the filter is 5- Find frequency response of the designed filter.

(b) Design an IIR Butterworth filter satisfying the following specification using bilinear transformation, assume $T_s = 1$ sec. 10

$0.707 \le |H(\omega)| \le 1.0 \quad 0 \le |\omega| \le \pi/2$

$|H(\omega)| \le 0.2 \quad \frac{3\pi}{4} \le |\omega| \le \pi$

6. (a) Realise the filter using direct form - I, cascade and parallel form if 10

$$H(z) = \frac{1 + \frac{1}{2}z^{-1}}{(1 + \frac{1}{4}z^{-1})(1 + \frac{1}{3}z^{-1})}$$

(b) Enumerate the application of DSP in Biomedical Engineering. Explain any one in detail. 10