T.E/V/CBAS/Bm/BDSP 07/12/15

12/15 T.E.-V Sem. Biomedical

Biomedical Digital Signal processing

(18) QP Code : 5699

(3 Hours) [Total Marks : 80

N.B.: (1) Question no. 1 is compulsory
(2) Attempt any three of the remaining five questions.
(3) Assume data if necessary mention clearfy the same.

1. a) Given a signal $x(t) = 5\cos(2\pi.1500t)$ for $t \geq 0$ sampled at rate of 8000Hz. 5
   i) Sketch the spectrum of the orginal signal.
   ii) Sketch the spectrum of the sampled signal from 0 to 20KHz.
   b) Find the DTFT of the signal $(n+1)(0.5)^n u[n]$. 5
   c) Find x[n] if $X(z) = \frac{1}{(1-z^{-1})(1-z^{-2})}$ $|z|>1$ 5
   d) Determine H(z) using impulse invariant technique of 5

$$H(s) = \frac{1}{s^2+3s+2}, \quad Ts = 0.5sec$$

2. a) Perform linear convolution of 5
   $x_1(n) = [1, 2, 3, -1]$ and $x_2(n) = [1, -1, 2, -2]$
   Using circular convolution method only.
   b) Check whether the following system is linear, stable or not. Justify. 5
   $y[n] = e^{[x[n]+3]}$ where x[n] is the input and y[n] is the output.
   c) Prove the circular time shift property of DFT. 5
   d) Find DFT of the sequence [1, 2, 3, 4, 5] 5

3. a) Derive and Draw the flow graph of 8-point DIT-FFT using Radix 2 - Algorithm. 10
   b) Explain overlap and add method of filtering of long data sequence using proper example. 10

4. a) Determine the magitude and phase response of the following system. 5

$$y[n] = \frac{1}{2}[x[n] + x(n-1)]$$

   b) Given $x[n] = [1, 2, 3, 4, 4, 3, 2, 1]$ find X (k) using Radix -2 DIF FFT algorithm. Draw the flowgraph. 10
   c) Use 4-point inverse FFT algorithm to find x(n) if $X(k) = [6, -2+j2, -2, -2-j2]$ 5

[TURN OVER

muquestionpapers.com

07/12/15 TE/V/CBGS/BM/BDS

(3) QP Code : 5699

5. a) The desered frequency response of a low-pass filter is 10

$$Hd(e^{j\omega})| = e^{-j3\omega} \quad \frac{-3\pi}{4} \le \omega \le 3\frac{\pi}{4}$$

$$= 0 \quad \frac{3\pi}{4} \le |\omega| \le \pi$$

Determine $H(e^{j\omega})$ for M = 7 using a Hamming window.

b) Realise the system using the direct form-I and II given 5

$$y[n] = \frac{3}{4}y[n-1] - \frac{1}{8}y[n-2] + x[n] + \frac{1}{3}x[n-1]$$

where y(n) is the output and x(n) is the input

c) Find the order of the Chebyshev filter that satisfy the following specification. 5

$0.8 \le |H(e^{j\omega})| \le 1, \quad 0 \le |\omega| \le 0.2\pi$

$|H(e^{j\omega})| \le 0.2, \quad 0.6\pi \le |\omega| \le \pi$

Use impulse invariant transformation.

6. a) Design a digital Butter worth filter to meet the following specification, using bilinear transformation 10

$0.8 \le |H(e^{j\omega})| \le 1, \quad 0 \le |\omega| \le 0.25\pi$

$|H(e^{j\omega})| \le 0.2, \quad 0.6\pi \le |\omega| \le \pi$

b) Explain the application of DSP on Biomedical Engineering. 10

---

muquestionpapers.com