(SEM-VI)

AGJ 2nd half (g+) 21

DSP.

Dec 11

Con. 6728-11.

MP–3604

(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 any data if **necessary** and **clearly** state it.

Sem - VI (Biomedical) Exam 8.14.2011 (Sub - D.S.P.)

20/12/11

1. Solve the following: 20

(a) Determine whether the following signal is Energy or Power signal

$x(n) = 3^n u(n)$

(b) Given the sequence $x_1(n) = \{1, 2, 3, 4\}$ and $x_2(n) = \{4, 1, 2, 1\}$

Find $x_3(n)$ such that $X_3(K) = X_1(K) . X_2(K)$

(c) Find Z - transform of

$$x(n) = \left(\frac{-1}{2}\right)^n u(-n) + 2\left(\frac{1}{4}\right)^n u(-n)$$ Specify its ROC.

(d) Determine the convolution of the two sequences:

$x(n) = \{3, -2, 4\}$ and $h(n) = \{4, 2, -1\}$

2. (a) Determine the impulse response and step response of the following causal system.

$$y(n) = \frac{3}{4}y(n-1) - \frac{1}{8}y(n-2) + x(n)$$ 10

(b) Determine the frequency response for the system and plot the magnitude and phase response at $\omega = 0, \frac{\pi}{4}, \frac{\pi}{2}, \frac{3\pi}{4}$ and π. What is the type of this filter?

$$y(n) = x(n) + 0.9x(n-1) - 0.4y(n-1)$$ 10

3. (a) Find DFT of the sequence $x(n) = \{1, -2, 3, -5\}$.

from above result find DFT of the following sequence

$x_1(n) = \{1, -5, 3, -2\}$ And $x_2(n) = \{-5, 1, -2, 3\}$ 10

(b) Derive the radix - 2 DIT-FFT for a 4-point DFT. 10

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4. (a) The difference equation of the system is given by 10

$$y(n) - 0.5y(n-1) = 2(0.25)^n u(n) \quad with\ y(-1) = -2$$

Determine (i) Zero state Response

(ii) Zero input response

(iii)Total response.

(b) A LTI system is characterized by system function 10

$$H(z) = \frac{3 - 4z^{-1}}{1 - 3.5z^{-1} + 1.5z^{-2}}$$

Specify the ROC and determine h(n) for all the conditions.

5. (a) A low pass filter is to be designed with the following desired frequency response

$$H_d(e^{j\omega}) = \begin{cases} e^{-j2\omega}, & -\pi/4 \le \omega < \pi/4 \\ 0, & \pi/4 \le |\omega| \le \pi \end{cases}$$

Design the filter coefficients if the window function is defined as-

$$W(n) = \begin{cases} 1, & 0 \le n \le 4 \\ 0, & otherwise \end{cases}$$

Also, determine the frequency response $H(e^{j\omega})$ of the designed filter. 10

(b) A low-pass filter has following specifications 10

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

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

Find the filter order and analog cutoff frequency if –

(i) Bilinear transformation technique is to be used for designing.

(ii) Impulse invariance technique is to be used for designing.

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Q.6. (a) Perform convolution using overlap-add and overlap-save method of x(n)={1,2,3,4,5,6,7,8} and h(n)={1,1,1} 10

(b) Realize following transformation in direct form I, direct form II, Cascade and Parallel form. 10

$$H(z) = \frac{z^2+0.6z+0.08}{z^2+0.8z+0.15}$$

Q.7. (a) Compare general purpose Microprocessor with DSP Processors. 10

(b) Application of Filters on biomedical signals. 10