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Biomed / I | CBSGS / BDSP.

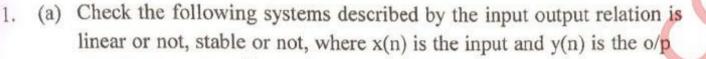
Bromedical Digital Signal Processing QP Code: 564400

(3 Hours)

Total Marks: 80



- (2) Answer any three from remaining five questions.
- (3) Assume any data if necessary justify.



- (i) $y(n) = (n+1) e^{x(n)}$
- (ii) y(n) = x(n) x(n-1)
- (b) Prove the circular time shift property of DFT.
- (c) Compute the linear convolution of x(n) = (1,2,3,-1,2,-1) and 5

$$h(n) = (1,2,1)$$
 using z-transform property only.

(d) Show that the filter with impulse response h(n) = (0.075, -0.1592, 0.2251, 0.75, 0.2251, -0.1592, 0.075) is

a linear phase filter.

 (a) Check whether the signals are periodic or not, if periodic, find the period.

(i)
$$x(n) = e^{j7n}$$

(ii)
$$x(n) = \cos\left(\frac{7\pi}{3}n + \pi/4\right)$$

(b) Find DTFT of the signal
$$x(n) = \left(\frac{1}{2}\right)^n u(n)$$

(c) Find magnitude and phase response of the system described by the inputoutput relation

$$y(n) = \frac{1}{2} \left[x(n+1) + x(n) + x(n-1) \right], \text{ where } y(n) \text{ is the output and } x(n)$$

is the input.

(d) Find DFT of the signal x(n) = (1,2,3,4). From the DFT of x(n), find the DFT of the signals of $x_1(n) = (3,4,1,2)$ and $x_2(n) = (4,6,4,6)$ using properties of DFT only, not otherwise.

Bromed / I/ CBSGS/ BDS A

QP Code: 564400 (a) Develop 8-point, Radix-2 DIF FFT algoritham, draw the flow graph. Find 3.

10 DFT of the signal x(n) = (0,1,2,3,4,5,6,7) using the above flow graph.

(b) Using inverse DFT algorithm find x(n) if X(k) = (20,5.828-j2.414, 0,10 -0.172-j0.414, 0, -0.172 + j0.414, 0, 5.828 + j2.414) Draw the flow graph

4. (a) Explain over-lap and add method for finding the linear convolution of 10 long data sequnce given x(n) = (1,2,3,4,5,6,7,-1,1,2,3,-1,5,4,1,2) and h(n) = (1,2,-1)Realise the filter with impulse response.

(b) Realise the filter with impulse response.

 $H(z) = \frac{1 - \frac{1}{2}z^{-1}}{(1 + \frac{1}{2}z^{-1}) (1 + \frac{1}{2}z^{-1})}$ using direct form-1 cascade and parallel

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form structures.

(a) Design a FIR filter with the following desired frequency response. 5.

$$\begin{aligned} H_{d}(e^{j\omega}) &= 0 \quad \text{for } \frac{-\pi}{4} < \omega < \pi/4 \\ &= e^{-j3\omega} \quad \text{for } \frac{\pi}{4} \le \omega | \le \pi \end{aligned}$$

Determine the filter co-ffficients of h(n) if the Hamming window is used, determine the frequency response H(eiω) of the designed filter.

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

$$0.9 \le |H(e^{j\omega})| \le 1$$
 $0 \le |\omega| \le \pi/2$
 $|H(e^{j\omega})| \le 0.2$ $\frac{3\pi}{4} \le |\omega| \le \pi$

(a) Convert the analog filter transfer function $H(s) = \frac{1}{(s+1)(s+2)}$ into a digital filter transfer function using impulse invariant technique assume $T_s = 1 \text{ sec.}$

(b) Draw and explain briefly the architecture of any one DSP processor.

(c) Explain briefly the application of BSP in Biomedical engineering.