Biomedical T.E. Sem-V (CBSGIS) 27/05/16

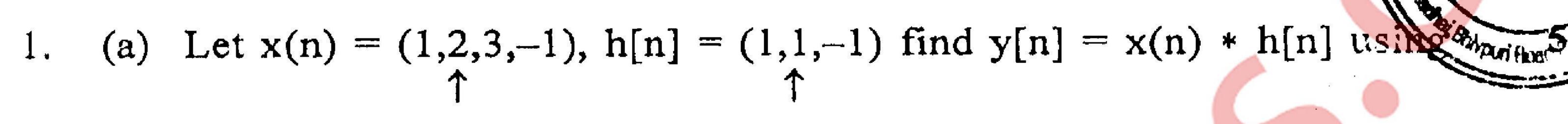
Biomedical Digital Signal Processing,

QP Code: 31181

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(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.



Z-transform properties only

- (b) Prove the time shifting property of DFT
- (c) Let x[n] = (1,2,3) find, 3-point DFT of the sequence
- (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.
- 2. (a) Determine x(n) if $X(z) = \log (1 + az^{-1})$; |z| > |a|(b) Find DT FT of the signal
 - x[n] = 1 of the signal x[n] = 1 of $0 \le n \le 4$ = 0 else where
 - (c) Find x(n) if X(z) = $\frac{1}{1 + \frac{1}{6}z^{-1}} \frac{1}{\frac{1}{6}z^{-2}}$ if the signal is right sided.
 - (d) If x[n] = (1,2,3,4), h[n] = (1,1,1) find the circular convolution of x[n] and h(n)
- 3. (a) Find x[n] if X(k) = (10,-2+j2,-2,-2-j2) using IDFT radix -2, FFT algorithm. Draw the flow graph.
 - (b) Prove the frequency shifting property of DFT
 - (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.
- 4. (a) Explain overlap add-method and overlap save method of linear filtering of long data sequence, with proper example.
 - (b) Develope the radix -2, DIFFFT algorithm for finding the 8-point DFT, draw the flow graph.

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FW-Con. 11340-16.

5. (a) Design an FIR filter satisfying the following specification $H_d(e^{j\omega}) = e^{-j2\omega}$ $-\pi/4 \le \omega \le \pi/4$

$$= o \quad \pi/4 < |\omega| \leq \pi$$

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.

$$0.707 \le |H(\omega)| \le 1.0$$

$$0 \le |\omega| \le \pi/2$$

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

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.