TE/ SEM V / BIOMED / CBSGS / MAY 2017

(15) **QP Code : 564402**

(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 necessary justify.

1. (a) Check whether the system given by input output relation $y(n) = ne^{x(n)}$ is linear and time invariant or not where y(n) is the output and x(n) is the input **5**
(b) Prove the convolution property of the DFT **5**
(c) Find the Fourier transform of **5**

$$x(n) = \left(\frac{1}{2}\right)^n u(n)$$

(d) Find X(z) if $x(n) = \cos(\omega_0 n)\, u(n)$ **5**

2. (a) Compute the linear convolution of x(n) and h(n) using z-transform property $x(n) = \{1,2,3,4\}$ and $h(n) = \{1,1,1\}$ **5**
(b) Find circular convolution of the sequence **5**
$x_1(n)$ and $x_2(n)$ given by
$x_1(n) = \{2,1,-1,3\}$; $x_2(n) = \{1,2\}$
(c) Obtain transfer function and draw magnitude spectrum of the given difference equation. **5**

$$y(n) = \frac{x(n) - x(n-2)}{2}$$

(d) Explain how many multiplications are required to compute a N-point DFT and using a N-point FFT algorithm **5**

3. (a) Compute the DFT of the given signal **5**
$x(n) = \{5,1,-1,2\}$
(b) Compute the IDFT of the given signal using DIT-FFT Butterfly diagram **5**
$X(k) = \{3,2+j, 1,2-j\}$
(c) Derive and draw the Butterfly diagram for a 8-point DIF-FFT using Radix-2 algorithm **10**

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4. (a) Using overlap and add method, obtain the response of the system when input is x(n) = {1,2,3,4,5,6,7,–1,2,–1.0,1,–1,1} and impulse response h(n) = {1,1,1} **10**

(b) Realize the system given below **10**

$$H(z)=\frac{1+2z^{-1}+z^{-2}}{1-0.75z^{-1}+0.125z^{-2}}$$

Using

(i) Direct form II

(ii) Parallel form

5. (a) The desired frequency response of a FIR low pass filter is **10**

$$H_d(\omega)=1 \; ; \; \frac{-\pi}{2}\leq|\omega|\leq\frac{\pi}{2}$$
$$=0 \; ; \text{otherwise}$$

Using a Rectangular window of length 7, obtain the filter coefficients

(b) Using Bilinear transformation, design a Butterworth filter which satisfies the following conditons **10**

$0.8\leq |H(e^{i\omega})| \leq 1 \quad 0 \leq |\omega| \leq 0.2\pi$

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

6. (a) Compare FIR and IIR filter **6**

(b) Explain briefly a Biomedical application of which requires the use of DSP **6**

(c) Draw and explain briefly the architecture of any one DSP processor. **8**
