[3 Hours] **[Total Marks : 80]**

Please check whether you have got the right question paper.

N.B: **1.** Q. **1** is **Compulsory**.
2. Attempt any **three** questions from **Q.2 to Q.6**
3. **Assume** suitable **data** wherever required.

1. **(A)** Find X(z) if x(n) = cos (w_on)u(n) **(05)**

(B) Find IDFT if X[k]={2,1+j,0,1-j} **(05)**

(C) Compare FIR and IIR filters **(05)**

(D) Convert analog filter to digital filter by Impulse Invariant Technique. Transfer function is given by $H(s)=\frac{1}{(s+4)(s+2)}$. Assume T = 1sec **(05)**

2. **(A)** Obtain Direct form I, Direct form II, Cascade realization of given Transfer function, **(10)**

$$H(z)=\frac{1+\frac{1}{4}z^{-1}}{\left(1+\frac{1}{2}z^{-1}\right)\left(1+\frac{1}{2}z^{-1}+\frac{1}{4}z^{-2}\right)}$$

(B) Prove convolution property of DFT, using the same find output response if, x(n) = {1, 2, 3, 4} and h(n) = {1, 2, 2, 1}

3. **(A)** Find x(n) if $H(z)=\frac{1}{1-\frac{1}{4}z^{-1}-\frac{1}{8}z^{-2}}$ for all possible ROCS. **(05)**

(B) Find DTFT: $x(n)=2^{-n}u(n)$ **(05)**

(C) Using unilateral Z transform, determine zero input, zero state and total response of system described by difference equation: $y(n)=\frac{1}{2}y(n-1)+x(n)$ **(10)**

Input is $\left(\frac{1}{3}\right)^n u(n)$. Initial condition: y(-1) = 1

4. **(A)** A linear phase FIR filter has desired frequency response: **(10)**

$$Hd\left(e^{jw}\right)=0 \quad \text{For} \frac{-\pi}{4}\le w\le\frac{\pi}{2}$$

$$=e^{-j2w} \quad \text{For}\frac{\pi}{4}<w\le\pi$$

Design filter using Hamming Window.

(B) Derive 8 point, Radix 2, DITFFT Algorithm and draw flow graph where x(n) = {1, 2, 3, 4, 4, 3, 2, 1} **(10)**

5. (A) Explain overlap and Add, overlap and save methods of linear filtering using an example **(10)**

(B) Design digital Butterworth filter having following specifications: **(10)**
Attenuation in pass band: 3 dB
Attention in stop band:15dB
Passband frequency: 0.5π rad
Stopband frequency: 0.75π rad
Using BLT method of mapping.

6. (A) For given specifications, find order and cut off frequency of chebyshev filter: **(06)**

$0.9 \leq |H(e^{jw})| \leq 1$; w:from 0 to 0.2π

$|H(e^{jw})| \leq 0.1$; w:from0.5π to π

Using BLT.

(B) Explain how many Additions and Multiplications are required to comput 'N' point DFT and using 'N' point FFT Algorithm. **(06)**

(C) Explain Any two applications of DSP in the field of Biomedical. **(08)**