

[Time: 3 Hrs]



[Marks: 80]

Please check whether you have got the right question paper.

- N.B:
1. Questions No 1 is compulsory.
 2. Solve any three questions of the remaining five questions.
 3. Assume any suitable data if required.

- Q. 1** Answer the following (**any four**) (20)
- a) Find the energy of the signal $x(n) = 0.2^n u(n) + 5^n u(-n-1)$
 - b) Find the value of $x(n) = \cos(0.25\pi n)$ for $n = 0, 1, 2, 3$ Compute the DFT of $x(n)$ using FFT flow graph.
 - c) Compare FIR and IIR filter.
 - d) State and prove the circular time shift property of DFT.
 - e) Write a short note on Decimation by a integer factor.
- Q. 2**
- a) Determine the output of a Linear FIR filter whose impulse response $h(n) = \{3, 7, 1\}$ For input $x(n) = \{5, 0, -2, 1, -3, -1, 0, 2, -3, 1, 4, 2\}$ Using overlap save method. (10)
 - b) Derive and draw the FFT flow graph for $N=6=2 \times 3$ using DITFFT algorithm. (10)
- Q. 3**
- a) Perform circular convolution using DFT and IDFT. $x(n) = \{1, -5, 3, 2\}$ $h(n) = \{2, 7, 4, 1\}$ (10)
 - b) Obtain DF-I, DF-II and cascade form of realization for the system $Y(n) = -0.1 y(n-1) + 0.2 y(n-2) + 3x(n) + 3.6 x(n-1) + 0.6 x(n-2)$ (10)
- Q. 4**
- a) A LPF has the desired response as given below:- (10)

$$H_d(e^{j\omega}) = \begin{cases} e^{-j3\omega} & 0 \leq \omega \leq \frac{\pi}{2} \\ 0 & \frac{\pi}{2} \leq \omega \leq \pi \end{cases}$$
 Determine filter coefficients $h(n)$ for $N = 7$, using frequency sampling technique.
 - b) A Low pass filter has the following specifications (10)

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

$$|H(e^{j\omega})| \leq 0.2 \quad 0.7\pi \leq \omega \leq \pi$$
 Find filter order and cutoff frequency.
 - i) By BLT method
 - ii) By IIT method used for design
- Q. 5**
- a) Frequency response of a filter is given by an expression. $h(e^{j\omega}) = e^{-j3\omega} [2 + 1.8 \cos 3\omega + 1.2 \cos 2\omega + 0.5 \cos \omega]$ Find impulse response of filter. (05)
 - b) The Transfer function of analog filter is $h(s) = \frac{1}{(s+1)(s+3)}$ Find $H[z]$ using Impulse Invariance method. (05)

- c) Let (05)
{20, 0, $-4+4j$, 0, -4 } be the first 5 points of 8 point DFT $X [K]$ of a real value sequence $x(n)$.
i) Find $X [K]$ for $K = 5, 6, 7$
ii) Find the 8 point DFT $P[k]$ such that $p (n) = (-1)^n x(n)$ using DFT property.

- Q. 6 a) Explain the architecture of any DSP processor with major blocks. (10)
b) Explain any one application of DSP (05)
c) Explain relationship between ZT, DTFT and DFT (05)
