

[Time: 3 Hours]

[Marks: 100]

Please check whether you have got the right question paper.

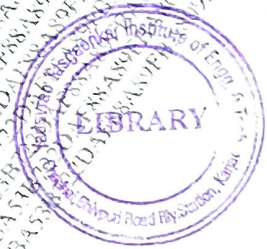
- N.B:
1. Q.1 is compulsory.
 2. Attempt any 3 from remaining questions.
 3. Figures to the right indicate full marks.
 4. Assume suitable data wherever required.

- Q.1 a) Determine Z transform of signal $x(n) = \delta(n+1) + 3\delta(n) + 6\delta(n-3) - \delta(n-4)$ (20)
 b) Explain block diagram of DSP.
 c) Compare IIR and FIR filters.
 d) Find $X(K)$ by DITFFT method of input sequence $x(n) = \{1, 2, 3, 4\}$.

- Q.2 a) Determine inverse Z transform (07)

$$X(Z) = \frac{Z}{3Z^2 - 4Z + 1}$$

for ROC $|Z| > 1$
 $|Z| < 1/3$
 $\frac{1}{3} < |Z| < 1$



- b) Compute response of the system to the input $x(n) = n u(n)$ (07)
 $y(n) = 0.7y(n-1) - 0.12y(n-2) + x(n-1) + x(n-2)$
 c) Explain the relation between DTFT and Z Transform. (06)

- Q.3 a) Given $x(n] = n + 1$ and $N = 8$. Find $X(K)$ by DITFFT algorithm. (10)
 b) The desired response of the low pass filter is (10)

$$H_d(e^{j\omega}) = e^{-3j\omega} \quad -\frac{3\pi}{4} \leq \omega \leq \frac{3\pi}{4}$$

$$= 0 \quad \frac{-3\pi}{4} < |\omega| \leq \pi$$

Determine $H(e^{j\omega})$ for $M = 7$ using Hamming window.

- Q.4 a) Determine order of Digital chebyshev filter to satisfy constraints. (05)

$$0.707 \leq |H(e^{j\omega})| \leq 1 \quad 0 \leq \omega \leq 0.2\pi$$

$$|H(e^{j\omega})| \leq 0.1 \quad 0.5\pi \leq \omega \leq \pi$$

Using bilinear Transformation and assume $T = 1$ sec.

- b) Convert analog filter with system function (05)

$$H(S) = \frac{S + 0.1}{(S + 0.1)^2 + 9}$$

into a digital IIR filter using bilinear Transformation. The digital filter should have resonant frequency $\omega_r = \frac{\pi}{4}$.

c) Develop cascade and parallel realization structure for

(10)

$$H(Z) = \frac{\frac{Z}{6} + \frac{5}{24} + \frac{5}{24}Z^{-1} + \frac{1}{24}Z^{-2}}{1 - \frac{1}{2}Z^{-1} + \frac{1}{4}Z^{-2}}$$

Q.5 a) Find DTFT of signal $x(n) = (\frac{1}{2})^n u(n)$ $n \geq 0$

(05)

b) Compute circular convolution by DIT / IDIT method

(10)

$$x(n) = \{1, 2, 3, 4\}$$

$$h(n) = \{5, 6, 7, 8\}$$

c) State and prove differentiation property of Z Transform.

(05)

Q.6 a) An FIR digital filter has unit impulse response sequence $h(n) = \{2, 2, 1\}$ and input sequence $x(n) = \{3, 0, -2, 0, 2, 1, 0, -2, -1, 0\}$.

(10)

Find output response of system by develop add and save method.

b) Explain applications of DSP to Biomedical engineering.

(10)
