P4-RT-Exam.-Oct.-12-2-40

Con. 10923-12. **KR-9248**

(3 Hours) [**Total Marks : 100**

N.B. : (1) Question No. **1** is **compulsory**. Answer any **four** from the remaining **six**.
(2) Assume **suitable** data if **necessary**. State **clearly**.

1. (a) Check whether the following signal is energy or power signal. Find the energy and power of the signal – **4**

$$x[n] = 3.(-1)^n \quad h \geq 0$$
$$= 0 \quad h < 0$$

(b) Find the circular convolution of the two sequence g[n] and h[n] where g[n] = [1, 1, 2, 1, 1] ; h[n] = [2, 2, 1, 1, 0]. **4**

(c) Check whether a system given by impules response $h[n] = (0.9)^n u[n+2]$ is stable, causal and memory less or not. Justify. **4**

(d) Compare JIR and FIR filters. **4**

(e) Prove the differentiation in frequency property of DTFT. **4**

2. (a) Find z-transform of $x[n] = (n + 1)(0.8)^n u[n]$. **4**

(b) Find the impulse response of the system having transfer function **6**

$$H(z) = \frac{18z^2}{z^2 - 5z + 6}$$ if the system is causal, is it causal ?

(c) Find the DTFS of the signal, **4**

$$x[n] = 3\cos[0.4\pi n] + 5\sin\left[\frac{\pi}{2}n\right]$$

Plot the spectrum.

(d) The DT system is given by the following difference equation – **6**
$y[n] - 5y[n-1] = x[n] + 4x[n-1]$, where y[n] is the output and x[n] is the input. Determine the magnitude and phase response.

3. (a) Find the 4-point DFT of the sequence – **5**

$$x[n] = [1, 0.707, 0, -0.707]$$

(b) Given x[n] = [0, 1, 2, 3, 4, 5, 6, 7], find x[k] using DIT FFT. **8**

(c) Develop DIT FFT algorithm for N = 6 using mixed radix FFT with N = 2.3. Draw the flow diagram. **7**

[TURN OVER

4. (a) Explain with suitable example, the overlap-add method of Block convolution using DFT. **7**

   (b) Find the DFT of the sequences x[n] = [1, 2, 0, 1] and h[n] = [2, 2, 1, 2] using 4-point DFT only once. **7**

   (c) $H(z) = \dfrac{3z(5z-2)}{\left(z+\frac{1}{2}\right)(3z-1)}$; using direct form-I realise the system. **6**

5. (a) A second order DT system is characterized by a difference equation y[n] – 0.1 y[n – 1] – 0.02 y[n – 2] = 2x[n] – x[n – 1]. Determine y[n] for $n \geq 0$ where x[n]=u[n], with initial conditions y(–1) = –10, y(–2) = 5. Determine impulse response, zero input response, zero state response. **10**

   (b) The desired response of a low pass filter is – **10**

$$Hd(e^{jw}) = e^{-j3w} \quad -3\pi/4 \leq w \leq 3\pi/4$$
$$= 0 \quad 3\pi/4 \leq |w| < \pi$$

   Determine $H(e^{jw})$ for M = 7 using Hamming Window.

6. (a) Design a digital Butterworth filter that satisfies the following constraint using bilinear transformation. **12**
   Assume T = 1 sec.

$$0.9 \leq \left|H\left(e^{jw}\right)\right| \leq 1 \quad 0 \leq w \leq \pi/2$$
$$\left|H\left(e^{jw}\right)\right| \leq 0.2 \quad 3\pi/4 \leq w \leq \pi.$$

   realise the filter using impulse invariance technique also.

   (b) What are the application of DSP in Biomedical signals ? **8**

7. (a) Draw the schematic block diagram of any one Digital Signal Process. Explain each block. **10**

   (b) What are the major feature that influence the selection of a DSP processor for a given application ? **6**

   (c) What is meant by linear phase filters explain group delay and phase delay ? **4**
