

(Following Paper ID and Roll No. to be filled in your Answer Books)

Paper ID :120662

Roll No.

**B.TECH.**

**Theory Examination (Semester-VI) 2015-16**

**FUNDAMENTALS OF DIGITAL SIGNAL PROCESSING**

*Time : 3 Hours*

*Max. Marks : 100*

**Section-A**

**Q.1 Attempt all parts. All parts carry equal marks. Write answer of each part in short. (2×10=20)**

- (a) Check the signal  $X_1(t) = \sin 5\pi t$  is periodic or non-periodic.
- (b) Describe the difference between stationary and non-stationary random signal.
- (c) State sampling theorem.
- (d) What are FIR and IIR systems?
- (e) What is antialiasing filter?

- (f) What is ROC of a digital system?
- (g) Write the difference equation for FIR filter.
- (h) What is an LTI System.
- (i) What is minimum phase system?
- (j) What is difference between DTFT and DFT?

### Section-B

**Q2. Attempt any 5 questions from this section.**

**(10×5=50)**

(a) Check whether the following digital systems are BIBO Stable or unstable.

a)  $y[n]=ax^2[n]$

b)  $y[n]=e^{-x[n]}$

c)  $y[n]=0.5x[n]-x[n-2]$

(b) Find the convolution of two finite duration sequence

$$x(n) = \begin{cases} 1, & -1 \leq n \leq 1 \\ 0, & \text{Otherwise} \end{cases} \quad \text{and} \quad h(n) = \begin{cases} 1, & -1 \leq n \leq 1 \\ 0, & \text{Otherwise} \end{cases}.$$

(2)

- (c) Describe the properties of Discrete Fourier Transform.
- (d) Write in detail about Quantization effects in Analog to digital conversion of signals.
- (e) Explain in detail about rounding and truncation errors.
- (f) Explain in detail and draw the flow graph of 8 point DFT for decimation in time decomposition.
- (g) Find  $X(k)$  for given  $x(n) = \{1,2,3,4,5,6,7,8\}$  and  $N=8$  using DIF-FFT algorithm.
- (h) A low pass filter is to be designed with the following desired frequency response.

$$H_d(e^{j\omega}) = \begin{cases} e^{-j3\omega} & , \quad \frac{-3\pi}{4} \leq \omega \leq \frac{3\pi}{4} \\ 0 & , \quad \frac{+3\pi}{4} \leq \omega \leq \pi \end{cases}$$

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

## Section-C

**Note: Attempt any 2 questions from this section. (15×2=30)**

Q3. Determine the direct forms I and II realizations for a third order IIR transfer function

$$H(z) = \frac{0.28z^2 + 0.319z + 0.04}{0.5z^3 + 0.3z^2 + 0.17z - 0.2}$$

Q4. Find  $x(k)$  for given  $x[n] = \frac{\cos n\pi}{2}$ , where  $N=8$  using DIF FFT algorithm.

Q5. Compare the direct computation of DFT with divide and conquer algorithm of DFT computation. What is twiddle factor? Define order of complexity in DFT and FFT.