**(DEE 323)**

# B.Tech. DEGREE EXAMINATION, MAY - 2015

## (Examination at the End of Third Year)

## ELECTRICALS AND ELECTRONICS

### Paper - III : Digital Signal Processing

**Time : 3 Hours**          **Maximum Marks : 75**

*Answer question No.1 compulsory*      **(15)**

*Answer any ONE question from each unit*      **(4 × 15 = 60)**

*1)*   a)   Define Symmetric and antisymmetric signals.

     b)   What is causality condition for an LTI system?

     c)   Define system function.

     d)   What is the time shifting property of the Z-transform?

     e)   State parseval's relation in Z-transform.

     f)   What is the difference between DTFT and DFT?

     g)   What is the relation between DFT and Z-transform?

     h)   How many complex additions and multiplications are needed in Radix-2 FFT?

     i)   What is impulse invariant transformation?

     j)   What are the requirements for an analog filter to be stable and causal?

     k)   What is an IIR filter?

     l)   What are the advantages of FIR filters?

     m)   What is the need of a window for FIR filter design?

n) Give the equation specifying Kaiser window.

o) What are the different types of structures for realizing IIR systems?

## UNIT – I

2) a) Find the circular convolution of the sequences x(n) = {–1, 1, 2, –2} and h(n) = {0.5, 1, –1, 2, 0.75} using concentric circles method.

b) Determine the inverse Z-transform of the function $X(Z) = \dfrac{3 + 2Z^{-1} + Z^{-2}}{1 - 3Z^{-1} + 2Z^{-2}}$ using partial fraction method.

OR

3) a) Determine the impulse response h(n) for the system described by the second order difference equation y(n) – 4y(n–1) + 4y(n–2) = x(n–1). Assume initial conditions.

b) Find the Z-transform and ROC of the signal $x(n) = -b^n u(-n-1)$

## UNIT - II

4) a) State and prove the circular time shift property of the DFT.

b) Compute the 4-point DFT of the following two sequences $x_1(n) = \{0,1,0,1\}$ and $x_2(n) = \{1,2,1,2\}$ using circular convolution.

OR

5) a) Compare the computations in Direct DFT and FFT.

b) Compute the FFT of the sequence x(n) = {1,2,3,0,3,2,1,0} using DIF-FFT.

## UNIT – III

6) a) Derive the impulse invariant transformation to transform an analog system to digital system.

b) Discuss the advantages and disadvantages of digital filters.

OR

7) a) For the analog transfer function, $H(S) = \dfrac{S+1}{(S+2)(S+4)}$, determine H(Z) using impulse invariant transformation if T = 0.5 seconds.

b) Discuss the Butterworth approximation.

## UNIT - IV

**8)**  a)  Find the direct form - I and direct form – II realizations of a discrete time system represented by

$$H(Z) = \frac{2Z^3 - 4Z^2 + 11Z - 8}{(Z-8)(Z^2 - Z + 3)} .$$

      b)  Explain the characteristics of rectangular window with typical sketches.

OR

**9)**  a)  Design a F/R lowpass filter using rectangular window by taking 7 samples of window sequence and with a cut off frequency, $W_c = 0.2 \pi$ rad/sample.

      b)  List the different types of structures for realization of IIR systems.

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