Registration No. : | | | | | | | | | | |

Total number of printed pages – 2

B. Tech

CPEC 5302

Fifth Semester (Special) Examination – 2013

DIGITAL SIGNAL PROCESSING

BRANCH CODE : EC

QUESTION CODE : D 274

Full Marks – 70

Time : 3 Hours

*Answer Question No. **1** which is compulsory and any **five** from the rest.*

The figures in the right-hand margin indicate marks.

1. Answer the following questions : 2×10

   (a) What is aliasing effect ? How it can be avoided ?

   (b) Express x (n) in terms of impulse function δ (n) when X(n) = {1, 3,2 1}.

   (c) State the conditions of stability for causal LTI system.

   (d) Draw the basic structure of 1st order digital FIR filter.

   (e) What do you mean by region of convergence (ROC) ? What is importance in discrete time system ?

   (f) Why FIR filters are inherently stable ?

   (g) State time shifting property of DFT.

   (h) How many real multiplication and addition is required for computation of 8-point DFT using decimation in time algorithm ?

   (i) Find the impulse response the LTI system shown below :

   $Y(n) = 0.5x(n-1) + 2x(n)$

   (j) What are different bands in a digital filter ? At which band an ideal filter is distortion less ?

2. (a) Determine the transient and steady state response of the system described by 5

   $x(n) = y(n-1) + 2y(n-2)$

   When a unit step function is applied to the system.

P.T.O.

(b) Find out auto correlation of the following signal 5

$x(n) = a^n u(n)$ $0 < a < 1$

Where u(n) the unit step is applied to the discrete time system.

3. (a) Find inverse Z-transform of 5

$X(z) = \log (1 - 2z)$ $|z| > |a|$

(b) Determine the range values of parameter a for which the LTI system with impulse response 5

$x(n) = a^n$ $n \geq 0$, n is even

$= 0$ otherwise

Is stable

4. (a) Convert the analog filter with the system function 6

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

Into a digital IIR filter using impulse invariance method. The digital filter is to have resonant frequency of 0.2.

(b) Establish the relation between ω and Ω using bilinear transformation. And then, bring out a mapping between them. 4

5. (a) Consider the casual system 6

$Y(n) = 0.75y(n-1) - 0.125y(n-2) + x(n) + 0.3x(n-1)$

Obtain direct form I and form II structure of the system.

(b) Explain how the IIR filter is designed from analog filter using bilinear transformation method. 4

6. (a) Establish the inverse Z-transform of X (Z) using Contour integration. 5

(b) State and prove scaling property of Z-transform. 5

7. (a) Explain Decimation in Time FFT algorithm. 5

(b) Prove that convolution of two signals in discrete time domain is equal to multiplication in discrete frequency domain. 5

8. Write short notes on any **two** of the following : 5×2

(a) System Modeling

(b) Linear phase FIR filter by frequency sampling method

(c) Adaptive Line Enhancer

(d) Minimum Mean Square Error Criterion.
