Reg. No. : .....

Name : .....

Seventh Semester B.Tech. Degree Examination, May 2013
(2008 Scheme)
08.703 : DIGITAL SIGNAL PROCESSING (E)

Time : 3 Hours Max. Marks : 100

PART – A

Answer **all** questions from Part – A.

1. Test whether the system y(n) = x(–n) is time invariant.
2. Explain the difference between Fourier series and Fourier transforms.
3. Find the minimum sampling rate for the continuous time signal given below to avoid aliasing x(t) = 5 cos 200 πt + 3 cos 500 πt.

   Write down the discrete time signal obtained after sampling.
4. Compare zero order hold and first order hold.
5. Find the poles and zeroes of the system described by the difference equation.

   $$y(n) - \frac{3}{4}y(n-1) + \frac{1}{8}y(n-2) = x(n) - x(n-1).$$
6. State and explain any two properties of Z transforms.
7. Explain the computational savings of FFT compared to direct evaluation of DFT.
8. Compare circular convolution and linear convolution.
9. What is Gibbs phenomenon ?
10. Realize the system function

    $$H(Z) = 1 + \frac{3}{4}Z^{-1} + \frac{17}{8}Z^{-2} + \frac{3}{4}Z^{-3} + Z^{-4}$$

    Using minimum number of multipliers.

(10×4=40 Marks)

P.T.O.

PART – B

Answer **one full** question from **each** Module.

Module – I

11. a) Given the sequence x(n) = {1, 0, 2, 3, 4, 5, 6}. Draw the following sequences

i) x(n – 5)

ii) x(n/3)

iii) x(2n)

iv) $x(n^2)$

v) x(5 – n). 10

b) Find the linear convolution

$x_1(n) * x_2(n)$

$x_1(n) = \{1, 0, 2, 4\}$

$x_2(n) = \{0, 1, 2, 3\}$. 10

12. a) State and prove time shifting and time reversal properties of DTFT. 8

b) Determine the forced response of the system $y(n) = \frac{5}{6}y(n-1) - \frac{1}{6}y(n-2) + x(n)$ when the forcing function is $x(n) = 2^n$, $n \geq 0$ and zero elsewhere. 8

c) Explain quantization and coding. 4

Module – II

13. a) Find the inverse transform for the following

$$X(Z) = \frac{Z(Z^2 - 4Z + 5)}{(Z-3)(Z-2)(Z-1)}$$

when ROC is (i) $2 < |z| < 3$ (ii) $|z| > 3$ (iii) $|z| < 1$ 10

b) A linear time invariant system is characterized by the system function

$$H(Z) = \frac{3 - 4Z^{-1}}{1 - 3.5Z^{-1} + 1.5Z^{-2}}$$

Specify the ROC of H(Z) and determine h(n) for the following conditions

i) The system is stable

ii) The system is causal

iii) The system is anticausal. 10

14. a) Find the response of an FIR filter with impulse response h(n) = {1, 2, 4} to the input sequence x(n) = {1, 2} using DFT & IDFT. 10

b) Obtain the 8 point DIT flow chart of radix 2 FFT algorithm. 10

Module – III

15. a) State and explain flow graph reversal theorem. 5

b) Obtain the direct form I, II, cascade and parallel realizations of

$$y(n) = y(n-1) - \frac{1}{2}y(n-2) + x(n) - x(n-1) + x(n-2).$$ 15

16. a) Explain the various methods of design of IIR filters from analog filters. 10

b) For the analog transfer function $H(S) = \frac{2}{(S+1)(S+2)}$ determine H(Z) using impulse invariance method. Assume T = 1 sec. 10