Roll No. _____

**ANNA UNIVERSITY**
**UNIVERSITY DEPARTMENTS**
**B.E./B.Tech. DEGREE END SEMESTER EXAMINATIONS, NOV/DEC 2011**
**Information Technology**
**5th Semester (Regulations – 2004)**
**IT375 Digital Signal Processing**

**Time: 3 hrs** **Max. Marks: 100**

**Answer ALL Questions**

**Part-A (10x2=20 Marks)**

1. Consider the analog signal x(t) = 3Cos100πt, determine the minimum sampling rate to avoid aliasing?
2. Determine the response of the following systems to the input signal

$$x(n) = \begin{cases} |n|, & -3 \le n \le 3 \\ 0, & otherwise \end{cases}$$

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

3. State Parseval's Theorem in DFT
4. Write the difference between Decimation in Time and Decimation in Frequency algorithm.
5. compare butterworth and chebyshev filter
6. What is meant by warping effect in IIR filter
7. Write the advantages of FIR filter over IIR filter
8. Compare hamming window and Kaiser window
9. Define limit cycle oscillation. List two techniques for handling limit cycle oscillation.
10. List any two applications of DSP.

**Part-B (5x16=80 Marks)**

11 (i) Determine the power and energy of the unit step sequence (6)

(ii) Find the Z-transform of the signal $x(n) = a^n u(n)+b^n u(-n-1)$ (10)

12. (a) (i) Find the DFT of a sequence x(n) = 1 for $0 \le n \le 2$
= otherwise
for N= 4. (6)

12. (a) (ii) Perform the circular convolution of the following sequences
x(n) = {1,1,2,1} h(n) = {1,2,3,4} using DFT and IDFT method (10)

**OR**

12. (b) (i) Given $x(n) = 2^n$ and N = 8, find X(k) using DIT - FFT algorithm (10)

12. (b) (ii) Compute the DFTs of the sequence x(n) = cos(nπ)/2 where N = 4, using DIF FFT algorithm. (6)

13. (a) (i) Using the bilinear transform, design a high pass filter, monotonic in pass band with cutoff frequency of 1000 Hz and down 10dB at 350 Hz. The sampling frequency is 5000 Hz (10)

13. (a) (ii) For the analog transfer function $H(s) = 2/(s+1)(s+2)$, determine H(z) using impulse variance method. Assume T = 1 sec. (6)

**OR**

13. (b) (i) Obtain the direct form-I, direct form-II, cascade and parallel form realization for the system $y(n) = -0.1y(n-1)+0.2y(n-2)+3x(n)+3.6x(n-1)+0.6x(n-2)$ (16)

14. (a) (i) Determine the impulse response h(n) of a filter having desired frequency response ,

$H_d(e^{j\omega}) = e^{-j(N-1)\omega/2}$ for $0<=|\omega|<=\pi/2$

$= 0$ $\pi/2<=|\omega|<=\pi$

N=7, use frequency sampling approach. (8)

14. (a) (ii) Obtain direct form and cascade form realization for the transfer function of an FIR system given by $H(z) = (1-(1/4)z^{-1}+(3/8)z^{-2})(1-(1/8)z^{-1}+(1/2)z^{-2})$ (8)

**OR**

14. (b) (i)Design an ideal high pass filter with a frequency response

$H_d(e^{jw}) = 1$ for $\pi/4 \leq |w| \leq \pi$

$= 0$ for $|w| \leq \pi/4$

Find the values of h(n) for N = 11. Find H(z). Plot the magnitude response using rectangular and hanning window (16)

15. (a) (i) Define quantization noise. Derive the formula for quantization noise power. (8)

15. (a) (ii) Discuss the representation of fixed point and floating point numbers. (8)

**OR**

15. (b) (i) Write notes on truncation error. (8)

15. (b) (ii) Explain the principle of vocoder with a neat diagram. (8)