



**B. E. / B. TECH. DEGREE END SEMESTER EXAMINATIONS, MAY/JUNE'2012**

**INFORMATION TECHNOLOGY**

**V SEMESTER (REGULATIONS 2008)**

**IT375 DIGITAL SIGNAL PROCESSING**

**TIME: 03 HOURS**

**MAXIMUM: 100 MARKS**

**ANSWER ALL QUESTIONS**

**PART A (10X2 = 20 MARKS)**

1. Define an LTI system.
2. What is the importance of Z transform?
3. How DFT is different than DTFT ?
4. State the number of complex multiplication and complex addition involve in N-point decimation-in-time FFT algorithms.
5. Define an FIR filter.
6. What is floating point representation?
7. State the advantages of IIR filter over FIR.
8. What is the cause for limit cycle oscillation?
9. Explain the advantages and drawbacks of Bilinear transformation.
10. How FIR filters are stable?

**PART B - (5X16 = 80 marks)**

11. Determine whether the system defined by the following input-output relation are linear time-invariant.

(i)  $y(n) = n x(n)$

(ii)  $y(n) = x(n^2)$

(iii)  $y(n) = x^2(n)$

(iv)  $y(n) = A x(n) + B$

12. (a)(i) Determine the 8-point DFT using DIF FFT algorithm of  $x(n)$  given by (10)

$$x(n) = \{3, 2, 1, 0, 1, 2, 1, 1\}$$

(ii) Represent DFT and IDFT in matrix form (06)

Or

(b) Develop 8-point radix-2 decimation in time algorithm with input in normal order and output in digit reversed order. Derive the necessary equations and show the flow diagrams.

13. (a) Design an FIR digital low pass filter with desired system function.

$$H_d(\omega) = e^{j3\omega}, \quad 0 \leq |\omega| \leq \pi/3$$
$$= 0, \quad \pi/3 \leq |\omega| \leq \pi.$$

Use Hamming window with  $N=7$ .

Or

(b) Realize the third order FIR transfer function

$$H_3(Z) = 1 + 1.2 Z^{-1} + 1.1 Z^{-2} + 0.1 Z^{-3}$$

in the form of the cascaded lattice structure and draw the resulting structure.

14. (a) Design an IIR digital low pass filter to meet the following requirements

Ripples in passband  $\leq 1$  dB, Passband cutoff freq. = 4 KHz

Ripples in stopband  $\geq 40$  dB, Stopband cutoff freq. = 6 KHz

Sample rate = 24 KHz.

Use bilinear transformation.

Or

(b) Realize the system with difference equation

$$y(n) = 0.75y(n-1) - 0.125y(n-2) + x(n) + 0.33x(n-1)$$

in (i) Direct form, (ii) cascade form, and (iii) parallel form.

15. (a) What is quantization noise? Derive suitable equation for the power of quantization noise.

Or

(b) (i) Present the model of speech wave from. (12)

(ii) What is vocoder? (04)