

**T 8164**

**B.E /B.TECH. DEGREE EXAMINATION, NOV/DEC 2006.**

**Fifth Semester**

**Electronics and Communication Engineering**

**EC 1302 – DIGITAL SIGNAL PROCESSING**

( Common to B.E . ( Part-Time) Fourth Semester Regulation 2005 )

Time: Three hours

Maximum: 100 marks

Answer ALL Questions

**PART A – ( 10 X 2 = 20 marks)**

1. Determine the DTFT of a sequence  $x(n) = a^n u(n)$ .
2. What is FFT?
3. Obtain the block diagram representation of a FIR system.
4. Give any two properties of Butterworth filter and Chebyshev filter.
5. Express the fraction  $7/8$  and  $-7/8$  in sign magnitude, 2's complement and 1's complement.
6. (a) What are the quantization errors due to finite word length registers in digital filters?

- (b) What are the different quantization methods?
7. What is zero padding? Does zero padding improve the frequency resolution in the spectral estimate?
  8. Explain deterministic and random signals with examples.
  9. Give the digital signal processing application with the TMS 320 family?
  10. What is the advantage of Harvard architecture of TMS 320 series?

**PART B – (5 X 16 = 80 marks)**

11. (a) (i) Calculate the DFT of the sequence  $x(n) = \{1, 1, -2, -2\}$  (6)

(ii) Determine the response of LTI system by radix -2 DIT FFT.

Or

- (b) (i) Derive the equation for Decimation-in-time algorithm for FFT. (8)

(ii) How do you do linear filtering by FFT using save-add method? (8)

12. (a) Design a high pass filter using hamming window, with a cut-off frequency of 1.2 radians/sec and  $N=9$ .

Or

- (b) Design a digital Butterworth filter satisfying the constraints

$$0.707 \leq |H(e^{jw})| \leq 1 \text{ for } 0 \leq w \leq \pi / 2$$

$$|H(e^{jw})| \leq 0.2 \text{ for } 3\pi / 4 \leq w \leq \pi$$

- 13.(a) Find the output round off noise power for the following transfer function

$$H(z) = H_1(z)H_2(z) \text{ where}$$

$$H_1(z) = \frac{1}{1 - a_1 z^{-1}} \text{ and } H_2(z) = \frac{1}{1 - a_2 z^{-1}} \text{ and } a_1 = 0.5 \text{ and } a_2 = 0.6.$$

Or

- (b) (i) Explain the characteristics of a limit cycle oscillation with respect to the System described by the difference equation ,  $y(n)=0.95 y(n-1)+x(n)$ . Determine the dead band of the filter. (10)

- (ii) Draw the product quantization noise model of second order IIR system. (6)

- 14.(a) Determine the performance characteristics of non-parametric power Spectrum estimator Welch, Barlett Blackman and Tukey.

Or

- (b) (i) Give the key features of the digital signal processor,  
(ii) Write short notes on: (9)

(1) 32-bit accumulator

(2) 16 x 16 bit parallel multiplier

(3) Shifter

15. (a) (i) Explain the function of auxiliary registers in the indirect addressing mode to point the data memory location. (8)

- (ii) Write a program to use the auxiliary register in memory pointing and looping .

Or

- (b) (i) Write a program to compute the following equation:

$$Y = A * X_1 + B * X_2 + C * X_3. \quad (8)$$

- (ii) Write a program to perform addition of two 64 bit numbers. (8)