Code No. 10392

FACULTY OF ENGINEERING

B.E. 3/4 (ECE) (II-Semester) Main Examination, April 2006

DIGITAL SIGNAL PROCESSING

Time : Three Hours] [Maximum Marks : 75

*Answer **All** questions of Part A.*

*Answer **FIVE** questions from Part B.*

PART—A

(Marks : 25)

1. List out four advantages of digital filters over analog filters.
2. State whether the following system is linear, stable and causal :

   $y(n) = x(-n)$.
3. The z-transform of $nx(n)$ is
4. Distinguish between DTFT, DFT and continuous Fourier transform.
5. State the differences between DIT FFT and DIF FFT algorithms.
6. The DTFT of $x^*(-n)$ interms of $X(e^{jw})$ is
7. What are the desirable properties of Windows ?
8. State the conditions under which FIR filters have linear phase characteristics.
9. Match the following :

Type of filter	*Frequency response*
(a) Chebyshev	(1) Equiripple in PB and SB
(b) Elliptic	(2) Monotonic in PB and SB
(c) Butterworth	(3) Equiripple only in one band.

10. If the analog filter transfer function is $H(s) = \frac{1}{s+3}$, find the transfer function of the digital filter using impulse invariant method.

PART—B

(Marks : 5×10=50)

11. (a) Find and sketch the frequency response of the system

$$y(n) - 5y(n-1) + 6y(n-2) = 2x(n) + 4x(n-1).$$

(b) Compute the circular convolution of the sequences

x(n) and h(n) where

x(n) = [4, 6, 8, 2] and h(n) = [3, 5, 7].

12. (a) Check whether the following systems are linear, shift invariant and causal

(i) $y(n) = \prod_{k=1}^{N} x(n-k)$

(ii) $y(n) = \frac{e^{x(n)}}{x(n-1)}$.

(b) Prove that the magnitude response of a digital filter is an even function of W.

13. (a) Find the DFT of the following sequences :

(i) x(2n)

(ii) x*(n).

(b) Let X(k) be a N-point DFT of the N-point sequence x(n).

If x(n) = –x(N – 1 – n), find X(0).

14. (a) Draw the signal flow graph of 8-point DIT FFT algorithm and explain.

(b) Hence calculate the FFT coefficients of the sequence

x(n) = [0, 2, 1, 2, –1, –2, –1].

15. (a) State the properties of FIR filters.

(b) Design a linear phase band pass FIR digital filter of length 9 to meet the following specifications :

Pass band : 1000 Hz to 2000 Hz

Sampling frequency : 10 kHz

Use Bertlett window.

16. (a) Compare impulse invariant and Bilinear transformation methods.

(b) Design a digital Butterworth low pass filter to meet the following specifications :

Pass band frequency	:	200 Hz
Stop band frequency	:	1000 Hz
Pass band attenuation	:	$\leq$ 3dB
Stop band attenuation	:	$\geq$ 20 dB

Assume suitable sampling frequency.

17. (a) Draw the diagram of a speech production system and explain.

(b) Explain how voiced/unvoiced sounds can be detected.