C 62963 (Pages : 2) Name.....

Reg. No.....

SEVENTH SEMESTER B.TECH. (ENGINEERING) DEGREE

(SUPPLEMENTARY) EXAMINATION, APRIL 2014

(2009 Scheme)

EE/PTEE 09 703—DIGITAL SIGNAL PROCESSING

Time : Three Hours Maximum : 70 Marks

Part A

Answer **all** *questions.*
Each question carries 2 *marks.*

1. Define twiddle factor of FFT.
2. State the main advantage of direct form II realization over direct form I realization.
3. State any *two* properties of Butterworth filter.
4. Explain dead band in limit cycles.
5. Name the three quantization errors due to finite word length registers in digital filters.

(5 × 2 = 10 marks)

Part B

Answer any **four** *questions.*
Each question carries 5 *marks.*

6. State and prove complex conjugation property of DFT.
7. Find N-point DFT for $x(n) = a^n$ for $0 < a < 1$.
8. The transfer function for an FIR filter is given by $H(z) = 1 - 1.35z^{-1} + 0.92\,z^{-2}$. Draw the direct form realization of the filter.
9. Explain backward difference method of transforming analog to digital filters.
10. Using impulse invariant technique, convert the following analog system to equivalent discrete system. Assume T = 1 sec.

$$H(s) = \frac{1}{(s+1)(s+2)}.$$

11. Compare fixed point and floating point representation of binary numbers.

(4 × 5 = 20 marks)

Turn over

Part C

Answer section (a) **or** *section (b) of each question.*
Each question carries 10 *marks.*

12. (a) Find the DFT of the sequence :

$x(n) = \{1, 2, 3, 4, 4, 3, 2, 1\}$ using **DIT-FFT algorithm.**

Or

(b) Find the output $y(n)$ of a filter whose impulse response is $h(n) = \{2, 2, 1\}$ and the input signal to the filter is $x(n) = \{3, 0, -2, 0, 2, 1, 0, -2, -1, 0\}$ using overlap-save method.

13. (a) Obtain Direct form I, Direct form II, cascade and Parallel structures for the system $y(n) - 0.1\,y(n-1) + 0.2\,y(n-2) + 3x(n) + 3.6\,x(n-1) + 0.6\,x(n-2)$.

Or

(b) Determine the lattice ladder structure for the filter function given by

$$H(z) = \frac{1 + 2z^{-1} + 2z^{-2} + z^{-3}}{1 + 0.55\,z^{-1} + 0.62\,z^{-2} + 0.34\,z^{-3}}.$$

14. (a) Design a digital Chebyshev filter to satisfy the constraints :

$$0.707 \le \left|H\left(e^{jw}\right)\right| \le 1, \qquad 0 \le w \le 0.2\,\pi$$

$$0 \le \left|H\left(e^{jw}\right)\right| \le 0.1, \qquad 0.5\,\pi \le w \le \pi$$

using bilinear transformation. Assume T = 1 sec.

Or

(b) Design a bandpass filter to pass frequencies in the range 1 to 2 rad/sec. using Hanning window with N = 5.

15. (a) Explain the architecture of TMS floating point DSP. Describe the function of each block.

Or

(b) Discuss about the effect of finite word length in the implementation of digital filters.

(4 × 10 = 40 marks)