D 90135 (Pages : 2) Name.....

Reg. No.....

FIFTH SEMESTER B.TECH. [ENGINEERING] (09 SCHEME) DEGREE EXAMINATION, NOVEMBER 2015

EC/PTEC 09 501—DIGITAL SIGNAL PROCESSING

Time : Three Hours Maximum : 70 Marks

Part A

Answer **all** *questions.*

1. What is zero padding ? What is the purpose of it ?
2. Draw the direct form structure of IIR filter.
3. What is the effect of quantization on pole locations ?
4. State the necessary and sufficient condition for the linear phase characteristic of a FIR filter.
5. Mention the salient features of DSP processors.

(5 × 2 = 10 marks)

Part B

Answer any **four** *questions.*

6. Determine the output response of the filter $y(n)$ if $h(n) = \{ 1, 1, 1, 1 \}$ and $x(n) = \{ 1, 2, 3, 1 \}$ by using

   (i) Linear convolution ; (ii) Circular convolution.

7. Find the DFT of the sequence $x(n) = \{ 2, 3, 4, 5 \}$ using radix-2 DIT-FFT algorithm.
8. Explain the process of rounding and truncation.
9. Apply impulse invariance technique to $H(s) = \frac{2}{(s+1)(s+2)}$. Find H(z) for T = 0.2sec.
10. What is warping effect ? How do you eliminate the same ?
11. Explain the addressing modes of TMS320 series processor.

(4 × 5 = 20 marks)

Part C

Answer **all** *questions.*

12. (a) (i) Compute the eight-point DFT of the sequence

$$x[n] = \begin{cases} 1 & , \quad -3 \le n \le 3 \\ 0 & , \quad \text{else} \end{cases}$$

by using the decimation-in-frequency FFT algorithm. (6 marks)

Turn over

(ii) State and prove circular convolution and circular time shift property of DFT. (4 marks)

Or

(b) (i) Explain overlap add method for linear FIR filtering of a long sequence. (4 marks)

(ii) Derive and draw the 8 point FFT-DIT butterfly structure. (6 marks)

13. (a) With respect to finite word length effects in digital filters, with examples discuss about

(i) Overflow limit cycle oscillation. (6 marks)

(ii) Signal scaling. (4 marks)

Or

(b) (i) Obtain the linear phase realization of the system function

$$H(z)=\frac{1}{2}+\frac{1}{3}z^{-1}+z^{-2}+\frac{1}{4}z^{-3}+z^{-4}+\frac{1}{3}z^{-5}+\frac{1}{2}z^{-6}.$$ (4 marks)

(ii) Explain with neat sketch, the implementation of FIR filters in the direct form and lattice form. (6 marks)

14. (a) (i) Using a rectangular window technique, design a low-pass filter with pass band gain of unity, cut-off frequency of 1000 Hz and working at a sampling frequency of 5 kHz. The length of the impulse response should be 7. (7 marks)

(ii) Write short notes on optimal method of designing FIR filters. (3 marks)

Or

(b) Design a Chebyshev filter with the following specifications

$\alpha_p = 1dB$ ripple in the pass band $0 \le \omega \le 0.2\pi$.

$\alpha_s = 15dB$ ripple in the stop band $0.3\pi \le \omega \le \pi$

using bilinear ransformation (assume T = 1 sec).

15. (a) (i) Explain the concept of extended parallelism. (5 marks)

(ii) Discuss the implementation of various DSP algorithms for various operations. (5 marks)

Or

(b) (i) Discuss the pipelining mechanism with an example. (5 marks)

(ii) Give an overall view of ADSP 21XX processor. (5 marks)

[4 × 10 = 40 marks]