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Question Paper Code : 51459

B.E/B.Tech. DEGREE EXAMINATION, MAY/JUNE 2016

Fifth Semester

Electrical and Electronics Engineering

EC 2314/10144 EC 502/EC 2361/10133 EE 502 – DIGITAL SIGNAL PROCESSING

(Common to Electronics and Communication Engineering and Instrumentation and Control Engineering)

(Regulations 2008/2010)

Time : Three Hours

Maximum : 100 Marks

Answer ALL questions.

PART – A (10 × 2 = 20 Marks)

1. Define unit step function.
2. Compare energy and power signal.
3. State the initial value and final value theorem of Z transform.
4. Find the convolution of the following two sequences $x(n) = \{ 2, -1, 3 \}$ and $h(n) = \{ 1, 2, 2, 3 \}$
5. Draw the basic butterfly diagram of radix 2 DIT and DIP FFT.
6. State Parseval's theorem of discrete Fourier transform.
7. Define group delay and phase delay of FIR filter.
8. What are the advantages of bilinear transformation ?
9. List out different stages in pipelining.
10. What are the different buses of TMS320 C5X ?

PART – B (5 × 16 = 80 marks)

11. (a) Explain the classification of discrete time system with suitable example. (16)

OR

- (b) State and explain sampling theorem with necessary diagram. (16)

12. (a) (i) Find the impulse response and frequency response of the following System :

$$y(n) = 1/2 y(n-1) + x(n) + 1/3 x(n-1) \quad (8)$$

- (ii) Determine the circular convolution of the following sequences :

$$x(n) = \{1, 0.5, 1, 0.5, 1, 0.5, 1, 0.5, \}$$

$$h(n) = \{0, 1, 2, 3\} \quad (8)$$

OR

- (b) Using long division method, determine the inverse Z transform of

$$X(Z) = 1/1 - (3/2) Z^{-1} + (1/2) Z^{-2}$$

$$\text{When ROC : } |Z| > 1 \text{ and ROC : } |Z| < 1/2 \quad (16)$$

13. (a) Compute 8 point DFT of the sequences using DIT-FFT algorithm

$$x(n) = \{0.2, 0.1, 0.2, 0.1, 0.2, 0.1, 0.2, 0.1\} \quad (16)$$

OR

- (b) State and prove all the properties of DFT. (16)

4. (a) Design a low pass filter of order 7 and cut off frequency of 1 rad/sec. Use rectangular window . Also plot the magnitude response of the filter. (16)

OR

- (b) Design a digital butterworth filter satisfying the following specification :
- $$0.707 \leq |H(e^{j\omega})| \leq 1; \quad 0 \leq \omega \leq \pi n/2$$

$$|H(e^{j\omega})| \leq 0.2; \quad 3\pi/4 \leq \omega \leq \pi.$$

Using bilinear transformation technique with $T = 1$ sec. (16)

- (a) Write short notes on :

(i) Multiplier and accumulator unit (8)

(ii) Arithmetic Logic Unit (8)

OR

- (b) Explain the different addressing modes of TMS320C5X with suitable examples. (16)
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