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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 Parsevals 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 :

$$y(n) = \frac{1}{2} y(n-1) + x(n) + \frac{1}{3} x(n-1) \quad (8)$$

- (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

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

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

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)

14. (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 :

$$0.707 \leq |H(e^{jw})| \leq 1; \quad 0 \leq w \leq \pi n/2$$

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

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

15. (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)