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**B.E. (FULL TIME) DEGREE EXAMINATIONS OCT/NOV 2011**

**Fourth Semester**

**Electrical and Electronics Engineering (R 2008)**

**EE 9254 - Digital Signal Processing**

**Answer ALL Questions**

**Max marks:100**

**Time: 3 Hrs**

**Part-A (10x2=20)**

1. Define Causality.
2. Find the Z transform of the sequence  $x(n) = \alpha^n u(n)$
3. Write any two differences between recursive and non-recursive filters.
4. Give any two properties of IIR filters.
5. Distinguish circular and linear convolution.
6. What is a twiddle factor?
7. Find the IDFT of the sequence  $X(k) = \{10, (-2+j2), (-2-j2)\}$
8. What is meant by truncation?
9. Write the expression for Hamming window and Hanning windows.
10. What are the features of a Digital Signal Processor over Microcontroller?

**Part-B (5x16=80)**

11. a) Consider the Discrete time systems described by the following equations.
  - i.  $y(n) = \cos [x(n)]$
  - ii.  $y(n) = x(n) + nx(n+1)$Check whether these systems are:
  - (i) Static or Dynamic
  - (ii) Linear or Nonlinear
  - (iii) Shift invariant or Shift variant
  - (iv) Causal or Non-causal
  - (v) Stable or Unstable

[16]
12. a) For the stable and causal system described by  $y(n) + 0.1 y(n-1) + 0.2 y(n-2) = x(n-1) + x(n)$ 
  - Determine  $H(z)$
  - Determine  $h(n)$

[16]

**[OR]**

b) Obtain the inverse Z transform of the following using partial fraction approach. [16]

$$X(z) = [1+2z^{-1}+z^{-2}] / [1-(3/4)z^{-1}+(1/8)z^{-2}], \quad |z| > 1/2$$

13. a. i) Draw the structural interpretation and the flow graph of decimation in time FFT algorithm for N=8. [8]  
ii) Explain how to get circular convolution using FFT. [8]

[OR]

b) Find the DFT coefficients of the input sequence [16]  
 $x(n) = \{1, 1, 1, 1, 1, 1, 1, 1\}$  using the radix-2 DIF-FFT algorithm.

14. a) i) Determine the peak ripple value –  $\bar{\delta}_p$  and  $\bar{\delta}_s$  for the peak pass band ripple  $\alpha_p = 0.15$  dB and  $\alpha_s = 41$  dB. [8]

(ii) The causal IIR digital filter transfer function is designed using the bilinear transformation method with  $T = 2$ . Determine their respective parent causal analog transfer function. [8]

[OR]

b) Design an analog Butterworth HPF with the following specifications: [16]  
o Pass band edge at 4 kHz  
o Stop band edge at 1 kHz  
o Pass band ripple of 0.1 dB  
o Minimum stop band attenuation of 40 dB  
Draw the magnitude and phase response also.

15. a) Explain in detail about the architecture of TMS 320C5416 Digital Signal Processor with neat sketches. [16]

[OR]

b) Discuss in detail, any six instructions used in TMS320C50X processors. [16]

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