
B.E DEGREE SEMESTER EXAMINATION NOV 2012

IV SEMESTER B.E EEE (FT)

EE 9254 DIGIAL SIGNAL PROCESSING

TIME:3 HRS **MAXIMUM:100 MARKS**

PART – A (10 * 2 = 20)

1. If x(1) = -x(-3) = 2, x(2) = 0 x(n) = 0 otherwise Determine $x(e^{jw})$

2. Find the Impulse response of the casual system described as follows.

   $Y(n) = x(n) - 2x(n-1) + x(n-2)$

3. Find the Z transform of the sequence $x(n) = 2^n u(n-2)$ and indicate the region of convergence

4. Find F(∞) for the sequence whose Z – transform is

   $$F(z) = \frac{z}{z - a} \qquad a \leq 1$$

5. Draw the block diagram represented by the following difference equation.
   $y(n) + ½\, y(n-1) = x(n) + ½\, x(n-1)$

6. Mention the methods of realizations of FIR systems

7. What is meant by frequency warping ?

8. Given two sequences of length N = 4 defined by $x_1(n) = (1,2,2,1)$ and $x_2(n) = (2,1,1,2)$, determine the periodic convolution.

9. Mention any two IIR filter realization methods.

10. What are the advantages of representing digital systems in block diagram form?

PART – B (5 * 16= 80)

11. Determine and sketch the convolution y(n) of the signals graphically and analytically.

$x(n) = n/3 \quad 0 \leq n \leq 6$
$= 0 \quad$ elsewhere
$h(n) = 1 \quad -1 \leq n \leq 2$
$= 0 \quad$ elsewhere

12. a. Determine all possible signals that can have the following Z-transforms
i) $X(z) = 1/(1-1.5z^{-1}+0.5z^{-2})$
ii) $X(z) = 1/(1-0.5z^{-1}+0.25z^{-2})$

(OR)

b. A casual LTI systems has the property that if the input is
$x(n) = 0.5^n u(n) - 0.25 (0.5)^{n-1} u (n-1)$
then the output is $y(n) = (1/3)^n u(n)$.
- Determine the impulse response
- Find the difference equation that characterizes this system
- Determine whether the system is stable or not.

13. a. Design and realize FIR linear phase digital filter with the ideal frequency response.

$H_d(w) = 1$ for $w \leq л$
Using Hamming window with N = 9, Sketch the magnitude spectrum

(OR)

b. Design a high pass Butterworth IIR digital filter that meets the following specifications: pass band ripple ≤ 3 db and pass band edge frequency of 0.48 л rad/sec and at least a stop band attenuation of 15db with a stop edge frequency of 0.24 л. Using impulse invariant transformation.

14. i) Determine the eight point DFT of the signal $x(n) = \{ 1,1,1,1,1,10,0\}$ using radix-2 DIF FFT algorithm and sketch its magnitude spectrum.

(OR)

ii) What is the need for FFT? What is the number of complex multiplications and additions that are required to complete the 512 point DFT using FFT.

15.(i) Determine direct Forms I and II for the second order filter given by

$$y(n) = 2b \cos \omega_0 y(n-1) - b^2 y(n-2) + x(n) - b \cos \omega_0 x(n-1)$$

(OR)

(ii) Draw the structures of cascade and parallel realizations of

$$H(z) = \frac{(1-z^{-1})^3}{(1 - 1/2\ z^{-1})(1 - 1/8\ z^{-1})}$$