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## EC-603

**B. E. (Sixth Semester) EXAMINATION, June, 2012**

**(Electronics & Communication Engg. Branch)**

**DIGITAL SIGNAL PROCESSING**

**(EC-603)**

*Time : Three Hours*

*Maximum Marks : 100*

*Minimum Pass Marks : 35*

**Note :** Attempt all the *five* questions. Choice is provided within every question.

1. (a) Given the sequence :

$$x(n) = (6 - n) [u(n) - u(n - 6)]$$

Make a sketch of : 10

(i)  $y_1(n) = x(4 - n)$

(ii)  $y_2(n) = x(2n - 3)$

(b) Determine whether the following system is periodic or not : 10

(i)  $x(n) = \cos(0.125\pi n)$

(ii)  $x(n) = \sin(\pi + 0.2n)$

*Or*

Find the solution to the difference equation : 20

$$y(n) = y(n - 1) - y(n - 2) + 0.5x(n) + 0.5x(n - 1)$$

Input  $x(n) = (0.5)^n u(n)$  with initial conditions  
 $y(-1) = 0.75$  and  $y(-2) = 0.25$ .

**P. T. O.**

2. (a) Find the z-transform of the following sequences : 10

(i)  $x(n) = \left(\frac{1}{3}\right)^n \cos(n\omega_0) u(n)$

(ii)  $x(n) = \alpha^{|n|}$

- (b) Find the inverse of the following z-transform : 10

(i)  $X(z) = \log\left(1 - \frac{1}{2}z^{-1}\right) \quad |z| > \frac{1}{2}$

(ii)  $X(z) = e^{1/2}$  with  $x(n)$  a right side sequence.

Or

Evaluate the following integral :

$$\frac{1}{2\pi j} \oint_C \frac{1 + 2z^{-1} - z^{-2}}{(1 - 0.5z^{-1})(1 - \frac{2}{3}z^{-1})} \times z^3 dz$$

where contour of integration 'C' is unit circle. 20

3. (a) Find the discrete time Fourier transform of the two-sided sequence : 10

$$x(n) = \left(\frac{1}{4}\right)^{|n|}$$

- (b) Find the frequency response of a linear system whose input and output satisfy the difference equation : 10

$$y(n) - 0.5y(n-1) = x(n) + 2x(n-1) + x(n-2)$$

Or

Find a difference equation to implement a system that has a unit sample response : 20

$$h(n) = \left(\frac{1}{4}\right)^n \cos\left(\frac{n\pi}{3}\right) u(n)$$

4. Describe decimation in time algorithm for fast Fourier transformation. 20

*Or*

What do you understand by Decimation in frequency algorithm for FFT ? Also discuss FFT algorithm for composite N. 20

5. Write notes on any *two* of the following : 10 each
- (i) FIR filter
  - (ii) IIR filter
  - (iii) Various kinds of windows
  - (iv) Bilinear transformation