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# EC-603 (GS)

## B.E. VI Semester

Examination, December 2017

## Grading System (GS)

## Digital Signal Processing

*Time : Three Hours*

*Maximum Marks : 70*

*Note:* i) Attempt any five questions.
ii) All questions carry equal marks.

1. a) Determine if the system described by the following input/ output equation are LTI.

   i) $y(n) = nx(n)$

   ii) $y(n) = e^{x(n)}$

   iii) $y(n) = x^2(n)$

   iv) $y(n) = A\,x(n) + B$

   b) Determine the particular solution of the first order difference equation

   $y(n) + a_1\, y(n-1) = x(n)\ |a| < 1$

2. a) Determine the impulse response $h(n)$ for the system described by the second-order difference equation

   $y(n) - 3y(n-1) - 4\ y(n-2) = x(n) + 2x\,(n-1)$

   b) Explain recursive and non recursive realization of FIR system.







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3. a) Determine the Z-transform of the signals

   i) $x(n) = a^2(\cos\omega_0 n)u(n)$

   ii) $x(n) = na^n u(n)$

   b) Determine the response of the system

   $$y(n) = \frac{5}{6}y(n-1) - \frac{1}{6}y(n-2) + x(n)$$

   to the input signal $x(n) = \delta(n) - \frac{1}{3}\delta(n-1)$

4. a) Determine the signal $x(n)$ whose Z-transform is given by

   $x(z) = \log\left(1 + az^{-1}\right)|z| > |a|$

   b) State and prove differentiation property and convolution property of Fourier transform.

5. a) State and prove circular convolution property of DFT.

   b) Compute the DFT of the Four point sequence $x(n) = (0, 1, 2, 3)$

6. Compute the N = 8 point DFT using Radix-2 decimation in time FFT algorithm.

7. a) Explain impulse invariance method of designing IIR digital filter.

   b) Explain Kieser window technique for designing FIR filter.

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