B.E./B.TECH Degree Examination, December 2020

Semester - VI

EE16603 – Discrete Time Signal Processing

(Regulation 2016)

Time: Three hours Maximum : 80 Marks

Answer **ALL** questions

PART A - (8 X 2 = 16 marks)

1. _____ of two signals is termed as Convolution.

   (a) Addition (b) Multiplication (c) both of these (d) none of these

2. Bilinear transformation is _____

   (a) One to two mapping (b) many to one mapping

   (c) one to one mapping (d) none of these

3. Poles of a Chebyshev filter lies on

   (a) Circle (b) ellipse (c) rectangle (d) none of these

4. Z transform of an impulse sequence is _____

   (a) One (b) Zero (c) x(n) (d) none of these

5. Compare the different types of signal representation.

6. Explain Sampling theorem.

7. Find the Z transform of x (n) = u (n) and its ROC.

8. Explain the various realizations of IIR filter?

PART B - (4 X16 = 64 marks)

09. (a) Determine whether the signals are power, energy or neither energy nor power signals. **(16)**

(i) $x(n) = \left(\frac{1}{3}\right)^n u(n)$ (ii) $x(n) = e^{j\left(\frac{\pi}{2}n + \frac{\pi}{4}\right)}$

(iii) $x(n) = \sin\left(\frac{\pi}{4}n\right)$ (iv) $x(n) = e^{2n}u(n)$

(OR)

(b) Determine if the system described by the followng equations are causal or non-causal, linear or non-linear and time variant or time-invariant. **(16)**

(i) $y(n) = x(n) + \frac{1}{x(n-1)}$ (ii) $y(n) = x^2(n)$

10. (a) Determine the Z transform and its ROC of the following signals. **(16)**

(i) $x(n) = r^n \sin \omega_o n\, u(n)$ (ii) $x(n) = a^n u(n)$

(OR)

(b) Obtain the direct form I, direct form II, cascade and parallel form realization for the given system. **(16)**

$$y(n) = -0.1y(n-1) + 0.2y(n-2) + 3x(n) + 3.6x(n-1) + 0.6x(n-2)$$

11. (a) Determine the 8-point DFT of the sequence x (n) = {1, 1, 1, 1, 1, 1, 0, 0} **(16)**

(OR)

(b) Compute the 4-point DFT of a sequence, x (n) = {0.5, 0.5, 0.5, 0.5, 0, 0, 0, 0} using radix-2 DIT and DIT algorithms. **(16)**

12. (a) Design a Chebyshev filter for the following specifications using (i) bilinear transformation and (ii) impulse invariance transformation. **(16)**

$$0.8 \le \left|H\left(e^{j\omega}\right)\right| \le 1 \quad 0 \le \omega \le 0.2\pi$$

$$\left|H\left(e^{j\omega}\right)\right| \le 0.2 \quad 0.6\pi \le \omega \le \pi$$

(OR)

(b) Design an ideal low pass filter with a frequency response **(16)**

$$H_d\left(e^{j\omega}\right) = 1 \text{ for } -\frac{\pi}{2} \le |\omega| \le \frac{\pi}{2}$$

$$= 0 \text{ for } \frac{\pi}{2} \le |\omega| \le \pi$$

Find the values of h(n) for N = 11. Find H (z).