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Total Number of Pages: 02

B.TECH
PCBM4302

5th Semester Regular / Back Examination 2015-16

SIGNALS AND SYSTEMS

Branch: AEIE, BIOMED, CSE, EC, EIE, ETC, IEE, IT

Time: 3 Hours

Max Marks: 70

Q.Code: T592

**Answer Question No.1 which is compulsory and any five from the rest.
The figures in the right hand margin indicate marks.**

- Q1** Answer the following questions: **(2 x 10)**
- a) What is sampling theorem? Find the Niquist rate of sampling of the signal given below
$$2\sin^2(1500\pi t) - \cos(1750\pi t)$$
 - b) Name three standard discrete signals used for analysis of discrete system. Which is most popular among the three? Justify.
 - c) Find out the step response of a system if the impulse response of the system is $h(n) = u(n - 5)$. Use Z-transform.
 - d) State the properties of discrete time convolution.
 - e) How many real multiplication and addition is required for computation of 32-point DFT?
 - f) What is linearity property of DFT?
 - g) Find DFT of $X^*(n)$?
 - h) Explain the time scaling property of z-transform.
 - i) Find the Fourier transform of $\sin \Omega t$.
 - j) State the properties of autocorrelation and cross correlation of discrete time sequence.
- Q2** a) What is discrete time signal? Differentiate between **(5)**
(i) periodic and a periodic Signals
(ii) energy and Power signals,
- b) Find the impulse response of the system $h(n)$ described by second order differential equation **(5)**
$$Y(n) = 2y(n - 1) - y(n - 2) + x(n) + 3x(n - 1)$$
- Q3** a) Find the Z-transform of the following signal **(5)**
(I) $x(n) = a^n u(n + 1)$
(II) $x(n) = n^2 u(n - 3)$
- b) Find inverse Z-transform of the casual signal $x(n)$ whose Z-transform is given as **(5)**

$$X(z) = \frac{1}{1 - 1.5z^{-1} - 0.5z^{-2}}$$

- Q4 (a)** Find the Fourier transform of $sgn(t)$ (5)
- (b)** Find continuous time Fourier transform of a periodic impulse train separated by period T and having amplitude A
- Q5 a)** Prove that DFT of real and even sequence is also real valued and even
- b)** Determine if the system is described by the input output equation $Y(n) = x(n) + 2x(n - 1)$ is stable /unstable, Linear/non linear. (5)
- Q5 a)** Find 4-point DFT of the signal, $X(n) = \{1, 1, 0, 1\}$ and sketch magnitude response (5)
- b)** The DFT of $x(n)$ is described as $X(k) = \{1, -1 + 2j, -1, 1 + 2j\}$. Find the DFT of $x^2(n)$ (5)
- Q6 (a)** Determine the range values of parameter a for which the LTI system with impulse response (5)
- $$x(n) = \begin{cases} a^n & n \geq 0, \text{ } n \text{ is even} \\ 0 & \text{otherwise} \end{cases}$$
- Is stable
- (b)** Prove that convolution of two signals in discrete time domain is equal to multiplication in discrete frequency domain
- Q7 a)** Determine pole- zero plot for the discrete signal (5)
- $$x(n) = \begin{cases} a^n & 0 \leq n \leq M - 1 \\ 0 & \text{otherwise} \end{cases}$$
- Where, $a > 0$.
- b)** The impulse response of LTI system is expressed as (5)
- $$h(n) = 0.2^n u(n)$$
- Find the value of A such that $h(n) - A h(n - 1) = \delta(n)$.
- Q8** Write short Notes on (Any two) (5 x 2)
- a)** Recursive and non-recursive realization of FIR system
- b)** Aliasing in time and frequency domain
- c)** circular correlation
- d)** Gibb's phenomenon