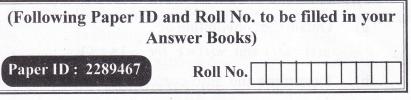
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NEC - 303



B.TECH.

Regular Theory Examination (Odd Sem - III), 2016-17 SIGNAL & SYSTEM

Time : 3 Hours

Max. Marks : 100

SECTION-A

- 1. Attempt all parts. All parts carry equal marks. Write
answer of each part in short. $(10 \times 2=20)$
 - a) Verify whether the given system described by the equation is linear and time-invariant. $x(t) = t^2$
 - b) Find the fundamental period of the given signal.

$$x(n) = \sin\left(\frac{6\pi n}{7} + 1\right)$$

- c) What is the relationship between Z transform and Fourier transform.
- d) State convolution property of Z transform.
- e) Find the fourier transform of

 $x(t) = \sin(\omega t) \cos(\omega t).$

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- f) Differentiate between CTFT & DTFT.
- g) Obtain the convolution of x(t) = u(t) and h(t) = 1 for $-1 \le t \le 1$
- h) Determine the auto-correlation function of the given signal. $x(t) = e^{(-t)} u(t)$
- i) What are the necessary conditions for an LTI system to be stable?
- j) Write the S domain transfer function of a first order system.

SECTION - B

- Note : Attempt any five questions from this section (5×10=50)
- 2. a) Given $x(t) = 5 \cos t$, $y(t) = 2e^{-t}$, find the convolution of x(t) and y(t) using Fourier transform.

b) If
$$X(s) = \frac{2s+3}{(s+1)(s+2)}$$
 find x(t) for

- a) System is stable
- b) System is causal
- c) System is non causal
- c) Determine the z-transform of following sequences with ROC
 - i) u[n]
 - ii) -u[-n-1]

iii)
$$x[n] = a^n u[n] - b^n u[-n-1]$$

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- d) Define invertible system and state whether the following systems are invertible or not
 - i) y(n) = x(n)
 - ii) $y(n) = x^2(n) + 1$
- e) Determine the impulse response function h(t) of an ideal BPF with passband gain of A and passband BW of B Hz centered on f_0 . Hz and having a linear phase response.
- f) A discrete time system is given as $y(n) = y^2(n-1)+x(n)$. A bounded input of x(n) = 2n is applied to the system. Assume that the system is initially relaxed: Check whether the system is stable or unstable.
- g) Differentiate between the following :
 - i) Continuous time signal and discrete time signal.
 - ii) Periodic and aperiodic signals
 - iii) Deterministic and random signals
- h) Show that if $x_3(t) = ax_1(t) + bx_2(t)$ then $X_3(W) = aX_1(\omega) + bX_2(\omega)$

SECTION-C

Note: Attempt any two Questions from this section. $(2 \times 15=30)$

3. The accumulator is excited by the sequence x[n] = nu[n].

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Accumulator can be defined by following input and output relationship.

$$y[n] = \sum_{k=-\infty}^{n} x(n)$$

Determine its output under the condition:

i) It is initially relaxed

ii) Initially y(-1) = 1

4. State and prove initial and final value theorem for z transform.

5. a) If Laplace transform of x(t) is $\frac{(s+2)}{(s^2+4s+5)}$ Determine Laplace transform of y(t) = x(2t-I)u(2t-I)

b) Use the convolution theorem to find the Laplace transform of

 $y(t) = x_1(t) * x_2(t), \text{ if } x_1(t) = e^{-3t}u(t) \text{ and } x_2(t) = u(t-2)$