Paper Id: | **130303** | | **Roll No:**

B. TECH
(SEM-III) THEORY EXAMINATION 2019-20
SIGNALS AND SYSTEMS

Time: 3 Hours   *Total Marks: 70*

Note: 1. Attempt all Sections. If require any missing data; then choose suitably.

SECTION A

1.   **Attempt *all* questions in brief.**   **2 x 7= 14**

   a) What are the necessary conditions for an LTI system to be stable?
   b) Differentiate between CTFT and DTFT.
   c) What are the limitations of Fourier transform?
   d) What are Poles and Zeros?
   e) Define energy and power signal.
   f) What is the relationship among Unit Impulse, Unit Step and Unit Ramp Signal?
   g) State frequency shifting and time shifting properties of Laplace transform.

SECTION B

2.   **Attempt any *three* of the following:**   **7 x 3 = 21**

   a) Explain the principle of linearity for discrete time system.
   b) Check whether the given system is time variant or causal $y(t) = t\, x(t)$.
   c) Find the relationship between s-plane and z-plane.
   d) Find and sketch the autocorrelation function, $R_{xx}(\tau)$ for $x(t) = e^{-at} u(t)$, $a > 0$.
   e) Given $X(s) = \dfrac{2s+3}{(s+1)(s+2)}$ find x(t) for
       i.   System is Stable.
       ii.   System is Causal.
       iii. System is Non Causal.

SECTION C

3.   **Attempt any *one* of the following:**   **7 x 1 = 7**

   a) Find the Fourier transform of the signal $x(t) = e^{-at} u(t)$ and plot its magnitude and phase spectrum..
   b) Find the DTFT for the following signal $x(n) = (0.5)^n u(n) + 2^{-n} u(-n-1)$.

4.   **Attempt any *one* of the following:**   **7 x 1 = 7**

   a) Sketch and check whether the given signal is periodic. If yes, compute its average power.
       $x(t) = \sum_{n=-\infty}^{\infty} e^{-(2t-n)} u(2t-n)$.
   b) Find energy and power signal
       (i) $x(t) = \cos(t)$
       (ii) $x(t) = A\, e^{-\propto t} u(t)$

5.   **Attempt any *one* of the following:**   **7 x 1 = 7**

a) State and Prove sampling theorem .
b) Define Nyquist Criterion and also explain under sampling, over sampling and critical sampling in detail.

6.   **Attempt any *one* of the following:**   **7 x 1 = 7**

a) State and prove Initial and Final value theorem for Z transform.
b) If the Laplace transform of $x(t) = \frac{S+2}{S^2 + 4S + 5}$, Determine Laplace transform of $y(t) = x(2t - I)\, u(2t - I)$.

7.   **Attempt any *one* of the following:**   **7 x 1 = 7**

a) Determine the impulse response of the discrete-time system
$y(n) - 3\, y(n-1) + 2\, y(n-2) = x(n) + 3x(n-1) + 2x(n-2)$
b) State and prove convolution property of DTFT.