

**B TECH**  
**(SEM-III) THEORY EXAMINATION 2019-20**  
**SIGNALS & SYSTEMS**

Time: 3 Hours

Total Marks: 100

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

## SECTION A

1. Attempt all questions in brief.

2 x 10 = 20

a.	Plot the graph of $x(t) = u(t + 1/2) + \delta(t+3)$
b.	Check whether the given system are Time Variant and Causal $y(t) = x(-t)$ .
c.	Write down the Final value condition related to Z- transform.
d.	Distinguish between Random & Deterministic signal.
e.	Calculate the Laplace Transform of the signal of $x(t) = u(-t)$ .
f.	Calculate the Energy of the signal $x(t) = e^{-t}u(t)$
g.	Write the condition to check the Stability of any LTI System.
h.	Define signal.
i.	Determine the DTFT of the signal $x(n) = \delta(n)$
j.	Prove that system $y(t) = x^2(-t)$ is non-linear.

## SECTION B

2. Attempt any three of the following:

10x3=30

a.	Check whether following systems are causal, linear and time invariant: i) $y(n) = x^2(n+4)$ ii) $y(t) = x(t-3)$
b.	Derive the time response of the second order system subjected to unit step input.
c.	For the Laplace transform of $x(t) = e^t \sin(2t) t \leq 0$ . Indicate the location of its poles and its region of convergence.
d.	Find the inverse Z transform of $X(z) = \frac{(z - \frac{1}{2})}{(z-1)(z-\frac{1}{3})} \quad  z  > \frac{1}{3}$
e.	Determine the Laplace transform & find out ROC for $x(t) = e^{-t}u(t) + e^{-4t}u(t)$ & depict the ROC and the location of poles and zeros in the s-plane.

## SECTION C

3. Attempt any one part of the following:

10x1=10

a.	A causal LTI system is described by difference equation. $y(n) = y(n-1) + 2 + x(n-1)$ Find the system function $H(z)$ for this system. Plot the poles zeros of $H(z)$
b.	Determine and sketch even and odd components for $x(t) = e^{-t}u(t)$

Paper Id: Roll No: 4. Attempt any *one* part of the following: 10x1=10

a.	Determine the fundamental period of the following signals. i) $x(t) = 2\cos(10t+1) - \sin(4t-1)$ ii) $x(t) = 1 + e^{j4\pi n/7}$
b.	Calculate the Z-Transform of $h_1(n)$ . sketch its ROC. $h_1(n) = \left(\frac{1}{3}\right)^n u(n)$

5. Attempt any *one* part of the following: 10x1=10

a.	Find the DTFT of the causal sequence $x(n) = a^n u(n)$ , $a < 1$ . Derive the Parseval's theorem related to Continuous Time Fourier Transform.
b.	Calculate the Fourier transform of $x(t) = e^{-t} u(t)$ Also Sketch its spectrum.

6. Attempt any *one* part of the following: 10x1=10

a.	Determine the Inverse Laplace Transform $f(t)$ of $F(s) = \frac{1}{(s+2)(s+4)(s+3)}$
b.	Calculate the Laplace transform of $x(t) = e^{-at} \sin \omega_0 t$

7. Attempt any *one* part of the following: 10x1=10

a.	Find the convolution $y(n) = x(n) * h(n)$ where $x(n) = \left(\frac{1}{2}\right)^n u(n), h(n) = u(n)$
b.	Explain system bandwidth and rise time for low pass filter and prove that $t_r = 0.35/B$ .