B TECH
(SEM IV) THEORY EXAMINATION 2017-18
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) What is the relationship among Unit impulse, Unit Step and Unit Ramp Signal?
b) Define energy and power signal?
c) State frequency shifting and time shifting property of Laplace transform?
d) State the final value theorem of Z-transform?
e) What is the sufficient condition for the existence of DTFT?
f) What are poles and Zeros?
g) Compare FT and DTFT?
h) Write the properties of Convolution?
i) What is the period of the signal x(t)=2cos(t/4)?
j) If two signals are x(n)={1,3,2,1} and y(n)={1,-2,3,2} then find x(n)+y(n).

SECTION B

2.   **Attempt any *three* of the following:**   **10 x 3 = 30**

a) Find the Even and Odd components of the following signal-

$$(i)x(t) = \cos t + \sin t + \cos t \sin t$$

$$(ii)x(n) = \{-2, 1, \underset{\uparrow}{2}, -1, 3\}$$

b) Find the relationship between s-plane and z-plane?
c) State and Proof the Parseval's Theorem?
d) Determine the output response y(n) if x(n) = {1,2,3,2} and h(n) = {1,2,2}.
e) Discuss the Block Diagram Representation, its importance and their elements?

SECTION C

3.   **Attempt any *one* part of the following:**   **10 x 1 = 10**

a) Find whether the signals are energy signal, power signal or not?

$$(i)x(t) = e^{-3t}u(t)$$

$$(ii)y(n) = \cos(\frac{n\pi}{4})$$

b) Sketch the following signal-
   (i)   -2u(t-1)
   (ii)   3r(t-1)
   (iii)   r(-t+2)
   (iv)   r(t)-2r(t-1) + 2r(t-3)-r(t-4)
   (v)   r(t)-2u(t-1)-r(t-2)

4. **Attempt any *one* part of the following:** 10 x 1 = 10

a) Find the impulse response function of the following function-

$$H(z) = \frac{0.2z}{(z+0.4)(z-0.2)} \quad ROC : |z| > 0.4$$

b) Find the Inverse Laplace transform of the following function-

$$X(s) = \frac{3s^2 + 8s + 6}{(s+2)(s^2 + 2s + 1)}$$

5. **Attempt any *one* part of the following:** 10 x 1 = 10

a) Find the Discrete time Fourier Transform of the following
$(i) x(n) = \{1, -1, 2, 2\}$

$(ii) x(n) = (0.5)^n u(n) + 2^{-n} u(-n-1)$

b) State and proof the convolution property of DTFT?

6. **Attempt any *one* part of the following:** 10 x 1 = 10

a) Determine whether the following system are time-invariant or not-
$(i) y(n) = x(n) + nx(n-1)$

$(ii) y(n) = x^2(n-1)$

b) Determine whether the following system are stable or not-
$(i) y(n) = x(n)x(n-1)$

$(ii) y(n) = x(n)u(n)$

7. **Attempt any *one* part of the following:** 10 x 1 = 10

a) By using Laplace transform, solve the following differential equation-

$$\frac{d^2 y(t)}{dt^2} + 3\frac{dy(t)}{dt} + 2y(t) = \frac{dx(t)}{dt} \; if y(0^-) = 2; \frac{dy(0^-)}{dt} = 1$$

$and x(t) = e^{-t}u(t)$

b) Find the initial and final values for the following transform

$$(i) \frac{s+5}{s^2 + 3s + 2}$$

$$(ii) \frac{s^2 + 5s + 7}{s^2 + 3s + 2}$$