JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -3 EXAMINATION- 2023

B.Tech-III Semester (ECE)

COURSE CODE (CREDITS):18B11EC412 (4)　　　　　　　MAX. MARKS: 35

COURSE NAME: FUNDAMENTALS OF SIGNALS AND SYSTEMS

COURSE INSTRUCTORS: RAJIV KUMAR　　　　　　　MAX. TIME: 2 Hours

Note: (a)All questions are compulsory.

(b)Marks are indicated against each question in square brackets.

(c) The candidate is allowed to make Suitable numeric assumptions wherever required for solving problems

Q-1: a) Justify that,

   (i)　　Unit step signal is integration of unit impulse signal　　　[1, CO-1]

   (ii)　　Laplace Transform is extension of continuous time Fourier transform.　　[1, CO-1]

b) Evaluate the Laplace transform and ROC for the following signal:

$$x(t) = 2\delta(t) - e^{-t}u(t) + e^{2t}u(t)$$　　　　　　[2, CO-4]

Q-2: a) Consider the signal

$$x(t) = e^{-5t}u(t) + e^{2t}u(t)$$

   Indicate the location of its poles and its region of convergence　　　[3,CO-4]

b) Explain with example of each the time shift property　　　[2,CO-4]

Q-3: a) Find the initial and final value of the signal $x(t)$ whose Laplace Transform is

$$X(s) = \frac{1}{(s+1)(s+2)(s+3)}$$　　　　　　[3,CO-4]

b) Using convolution property find the $X(s)$ and $x(t)$

$$x(t) = e^{-3t}u(t) * e^{-2t}u(t)$$

   Also, draw the $x(t)$ versus t　　　　　　[3, CO-4]

Q-4: a) Explain the time scaling property of Laplace Transform with giving example.

[2, CO-4]

b) Find the $x(t)$ using partial fraction method for the following $X(s)$:

$$\text{(i) } X(s) = \frac{5s+5}{(s+2)(s+3)}, \quad \text{(ii) } X(s) = \frac{s(2s^2+3)}{(s+1)^2(s+2)}$$

Also, in each case, draw $x(t)$ and also draw the ROC on s-plane

[3, CO-4]

Q-5: a) Explain the sampling property of unit impulse signal.

[2, CO-2]

b) Explain each the following giving one example of each: (i) Static system, (ii) Memory system, (iii) Anticipatory system, (iv) Linear system

[2, CO-2]

c) Draw the signal $y(t) = u(t-2) * u(t-4)$

[2, CO-1]

Q-6: a) What do you mean by the necessary and sufficient condition for stability? Explain

[3, CO-2]

b) Give one specific reason, why it is convenient to present a signal with help of Fourier Series.

[2, CO-3]

Qu-7: a) What are different transforms - Laplace, Fourier and z-transform of unit impulse signal?

[2, CO-3]

b) Find z-transform of the following signal:

$$x[n] = -2^n u(-n-1)$$

Plot the ROC and also give the Pole-Zero plot of it

[2, CO-4]