

JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -3 EXAMINATION- 2023

B.Tech-IV Semester (ECM)

COURSE CODE(CREDITS):20B11EM412

MAX. MARKS: 35

COURSE NAME:SIGNALS AND SYSTEMS

COURSE INSTRUCTORS: Dr 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) Laplace Transform is extension of continuous time Fourier transform. [1]
- (ii) z-transform is extension of discrete time Fourier transform [1]

b) Evaluate the z-transform and ROC of z-transform for the following discrete signal:

$$x(n) = 2^n u(n) - 3^{-n} u(-n) \quad [3]$$

Q-2: a) Find inverse z-transform $x(n)$:

$$X(Z) = \frac{8z}{2z + 1} + \frac{4z}{4z + 1}$$

Also, plot the $x(n)$ [3.5]

b) Explain with example of each the time shift property [1.5]

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

$$X(s) = \frac{1}{(s+1)(s+2)} \quad [2.5]$$

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

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

Also, draw the $x(t)$ [2.5]

Q-4: a) Explain time and frequency shifting properties of Laplace Transform with giving example of each. [2]

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

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

Also, in each case, draw the ROC on s-plane

[3]

Q-5: a) Explain the sampling or shifting property of unit impulse signal. [2]

b) Explain each the following giving one example of each

(i) Static system, (ii) Memory system, (iii) Anticipatory system [1.5]

c) Draw the signal $y(t) = u(t) * u(t - 1)$ [1.5]

Q-6: a) What do you necessary and sufficient condition for stability? Explain [3]

b) Give specific reason, why it is convenient to present a signal in sinusoidal or exponential form. [2]

Qu-7: a) What are Dirichlet conditions related with Fourier series? [2.5]

b) Give the Parseval's relation. Explain where it is applicable [2.5]