

JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -3 EXAMINATION- May-2018

B.Tech [CSE/IT], IV Semester

COURSE CODE: 10B11EC301

MAX. MARKS: 35

COURSE NAME: Signals and Systems

COURSE CREDITS: 04

MAX. TIME: Two Hours

Note: All questions are compulsory. Carrying of mobile phone during examinations will be treated as case of unfair means.

- Q.1 (a) Determine the Laplace transform and corresponding ROC of the signal: [04] CO4

$$x(t) = te^{-2|t|}$$

- (b) A system is represented by a differential equation: [04]

$$\frac{d^3y(t)}{dt^3} + 6\frac{d^2y(t)}{dt^2} + 11\frac{dy(t)}{dt} + 6y(t) = x(t), \text{ find the response of this system for input } x(t) = e^{-4t}u(t) \text{ \{Using Laplace transform\}}$$

- Q.2 (a) A discrete LTI system is defined by the following system function [04] CO4

$$H(z) = \frac{3 - 4z^{-1}}{1 - 3.5z^{-1} + 1.5z^{-2}}$$

Specify the ROC of $H(z)$ and determine $h(n)$ for the following conditions:

- (i) The system is causal
(ii) The system is stable

- (b) Determine the Z transform and corresponding ROC of the signal: [04]

$$x[n] = \left(\frac{1}{4}\right)^n \cos\left(\frac{n\pi}{3}\right) u[n]$$

- Q.3 State and prove sampling theorem for a band limited signal. Also explain the effect of aliasing in reconstruction of signal. [04] CO5

- Q.4 (a) What is Region of Convergence (ROC) for Z-transform? Also, write the properties of ROC. [03] CO4

- (b) Explain the mapping between s-plane and z-plane. [02]

- Q.5 (a) Find the Fourier transform unit step signal $u(t)$. [03] CO3

- (b) Proof the differentiation property of Fourier series. [02]

- Q.6 (a) Find the convolution of given sequences [03] CO2

$$x[n] = \{1, 5, 9, 11\} \text{ and } y[n] = \{-2, -7, 9\}$$

- (b) What is the correlation? Explain with an example. [02]