

328455(28)

BE (4th Semester)
Examination, April - May, 2018

[New Scheme]

Signals and Systems

Time Allowed : 3 hours

Maximum Marks : 80

Minimum Pass Marks : 28

Note : (i) Attempt all questions. Part (a) of each unit is compulsory. Attempt any two parts from (b), (c) and (d) of each unit. Answer should be to the point.

(ii) The figures in the right-hand margin indicate marks.

Unit-I

1. (a) Define Deterministic and Random signals. [2]
- (b) If $x_1(t)$ and $x_2(t)$ are periodic signals or A-periodic signal of time period T_1 and T_2 respectively, then what is the condition that sum (\sum) of $x_1(t)$ and $x_2(t)$ is periodic and what is the time period? [7]

(c) Consider the following signal :
 $x(t) = Ae^{-\alpha t} u(t)$, $\alpha > 0$ Is $x(t)$ an energy signal or a power signal? As $\alpha \rightarrow 0$, what is the nature of the signal $x(t)$? [7]

(d) Determine whether the given system is : [3+3+1]

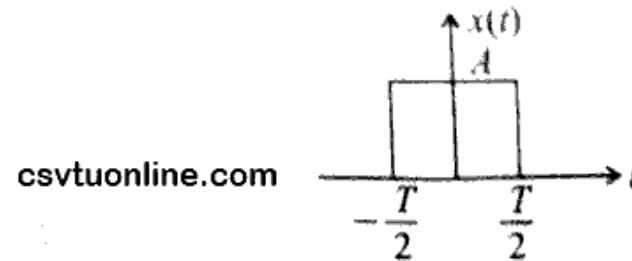
(i) $y(n) = 2x(n) + \frac{1}{x(n-1)}$ linear or non-linear [3] csvtuonline.com

(ii) $y(t) = t x(t)$ time variant or time invariant [3]

(iii) $y(n) = x(2n)$ causal or non-causal [1]

Unit-II

2. (a) Write Dirichlet conditions to obtain Fourier transform for a signal. [2]
- (b) Obtain the Fourier transform of a gate function given below. [7]



- (c) Write any three properties of Fourier transform and prove it. [7]
- (d) Find out the Fourier series representation of half-wave rectifier output waveform. [7]

[3]

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Unit-III

3. (a) Define the term Region of Convergence (RoC). [2]
 (b) Find out the z-transform and RoC of the signal given below [7]

$$x(n) = a^n u(n)$$

- (c) Find out the inverse z-transform for

$$X(z) = \frac{z^2}{(1-az)(z-a)} \quad \text{ROC: } a < |z| < \frac{1}{a} \quad [7]$$

- (d) Determine the impulse response of the system represented by the following equation : [7]

$$y(n) + 3y(n-1) + 2y(n-2) = 2x(n) - x(n-1)$$

Unit-IV csvtuonline.com

4. (a) Define the term linear time invariant system. [2]
 (b) Consider an LTI system with differential equation

$$\frac{d^2 y(t)}{dt^2} + 4 \frac{dy(t)}{dt} + 3y(t) = \frac{dx(t)}{dt} + 2x(t)$$

Find the frequency and impulse response (assume initial condition = 0). [7]

csvtuonline.com [4]

- (c) Find the frequency response and impulse response of a given system

$$y(n) - \frac{3}{4}y(n-1) + \frac{1}{8}y(n-2) = 2x(n-1) \quad [7]$$

[initial condition = 0, y(-1) = 0]

- (d) Determine the response of the system whose input sample response and input are given as follows : [7]

$$x(n) = u(n+1) - u(n-4) - \delta(n-5)$$

and $h(n) = [u(n+2) - u(n-3)] \cdot (3 - |n|)$

Unit-V

5. (a) Define the state of a system. [2]
 (b) Find the state space equation of LTI system with a differential equation

$$\frac{d^3 y(t)}{dt^3} + 2 \frac{d^2 y(t)}{dt^2} + 3 \frac{dy(t)}{dt} + 4y(t) = 5x(t) \quad [7]$$

- (c) Find the state space equation for discrete signal represented by

$$y(n) - \frac{3}{4}y(n-1) + \frac{1}{8}y(n-2) = x(n) \quad [7]$$

- (d) Define state transition matrix and write any four properties of state transition matrix. [7]

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