Seat No: _____ **Enrollment No: _____**

PARUL UNIVERSITY

FACULTY OF ENGINEERING & TECHNOLOGY

B.Tech. Winter 2019 - 20 Examination

Semester: 3 **Date: 09/12/2019**
Subject Code: 203107207 **Times: 10:30am to 01:00pm**
Subject Name: Signals and Systems **Total Marks: 60**

Instructions:
1. All questions are compulsory.
2. Figures to the right indicate full marks.
3. Make suitable assumptions wherever necessary.
4. Start new question on new page.

Q.1 **Objective Type Questions** - (Fill in the blanks, one word answer, MCQ-not more than Five in case of MCQ) (All are compulsory) (Each of one mark) **(15)**

1. The type of systems which are characterized by input and the output quantized at certain levels are called as
   a) analog b) discrete c) continuous d) digital
2. An example of a discrete set of information/system is
   a) the trajectory of the Sun
   b) data on a CD
   c) universe time scale
   d) movement of water through a pipe
3. Should real time instruments like oscilloscopes be time invariant?
   a) Yes
   b) Sometimes
   c) Never
   d) They have no relation with time variance
4. Is the signal x(t) = exp(-t)*sin(t) periodic in nature?
   a) Yes b) No
5. Comment on the linearity of y[n] = n*x[n].
   a) Linear b) Only additive c) Not scalable d) Nonlinear
6. Define Signal and System
7. Full form of LSI system is _____.
8. A system is said to be stable if _____
9. Power signal is defined as _____.
10. State Parseval's Theorem.
11. State properties of Linear Convolution.
12. Draw and define mathematically below signals: 1) CT decaying exponential 2) DT Unit Step
13. State Sampling theorem.
14. Define Laplace Transform.
15. Define Z-Transform and Region of Convergence (ROC)

Q.2 **Answer the following questions. (Attempt any three)** **(15)**

A) Determine whether following system is memoryless,causal,stable,time invariant, linear and invertible:

$$Y(t) = \cos [x(t)]$$

B) Sketch the following signals: x1[n] = u [n+1]-2 u[n]-2u[n-1]

C) Determine the Laplace transform of

i) x1(t) = exp(-2t) u(t)-exp(2t) u(-t)

ii) x2(t) = 3* exp(-2t) u(t) -2*exp(-t) u(t)

D) State properties of Fourier Series and explain Linearity property in detail

Q.3 A) Calculate the convolution of x(n) and h(n) if **(07)**

x[n] = { 1,1,0,1,1 } …… (origin is at third position i.e. at '0')

And h[n] = { 1,-2,-3,4 } …… (origin is at 4^{th} position i.e. at 4)

B) Determine Inverse laplace transform of the function , **(08)**

$X(s) = 1/ s^2+3s+2$, ROC : -2< Re(s)< -1

OR

B) Calculate linear convolution of x[n] = { 1,1,1,1 } and h[n] = { 2,2 } using basic convolution equation. **(08)**

Q.4 A) Determine Z transform of below sequence: **(07)**

i) x1(n) = { 1,2,3,4,5,0,7 } and

ii) Unit step sequence , u[n]

OR

A) Determine inverse z-transform of $X(z) = 1/ 1\text{-}1.5z^{-1}+ 0.5z^{-2}$ for **(07)**

i) ROC : $|z| >1$ and ii) ROC : $|z| < 0.5$

B) State properties of FT and DTFT and explain Periodicity and Scaling property of DTFT in detail. **(08)**