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

PARUL UNIVERSITY

FACULTY OF ENGINEERING & TECHNOLOGY

B.Tech. Winter 2019 - 20 Examination

Semester: 5 **Date: 09/12/2019**
Subject Code: 03107306 **Time: 10:30am to 01:00pm**
Subject Name: Signals Systems and Transformation **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)**

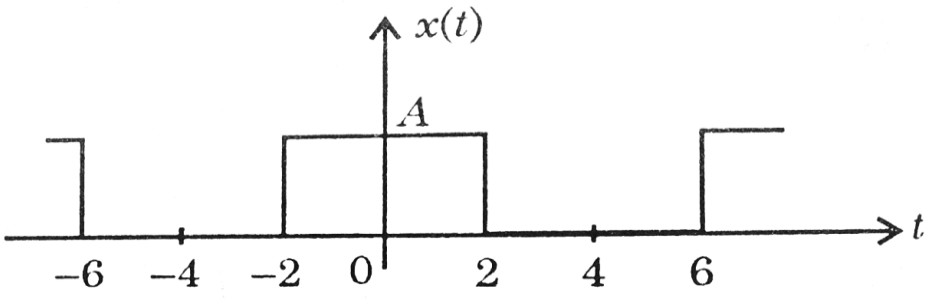
1. Describe Gate Function.
2. Define Causal Signal.
3. Which signal can be used to represent any arbitrary continuous-time signal I terms of this signal?
4. Give expression of convolution integral.
5. Define periodic signals.
6. Which operation in frequency domain is equal to multiplication in time domain?
7. Write Time shifting property of continuous-time fourier series.
8. Write equation to find fourier transform of discrete-time signal.(DTFT)
9. Define ROC with respect to z-transform.
10. Explain time reversal property the z-transform in short.
11. Which of the following is not a stable system?
    a) $x(t)\cos\omega_c t$
    b) $t\,x(t)$
    c) $x(t-1)$
    d) $x(\frac{t}{2})$
12. The impulse response $h(t)$ can be obtained by _____ the step response $s(t)$.
    a) Multiplying
    b) Dividing
    c) Integrating
    d) Differentiating
13. Select an option which is NOT applicable to system $y(t) = tx(t)$
    a) Linear b) time-invariant c) causal d) static
14. Fourier transform of impulse signal $\delta(t)$ is
    a) 1
    b) 0
    c) Sinusoidal signal
    d) None of the above
15. The z-transform of a unit step signal is
    a) 1
    b) $\frac{1}{1-z^{-1}}$
    c) $\frac{1}{(1-z^{-1})^2}$
    d) ∞

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

A) Calculate the output $y(t)$ of the system to the input $x(t) = U(t)$, if the impulse response of the system is given by $h(t) = e^{-at}U(t); a > 0$.

B) Obtain the output of an LTI causal discrete-time system described by the difference equation $y[n] - \frac{1}{5}y[n-1] = x[n]$ to the input $x[n] = K\delta[n]$.

C) Find the fourier series coefficients of waveform shown in figure below



D) Find a linear constant coefficient difference equation relating the input and output of the impulse response given by

$$h[n] = \left(\frac{1}{2}\right)^n U[n] + \frac{1}{2}\left(\frac{1}{4}\right)^n U[n]$$

Q.3 A) Explain properties of LTI system in detail. **(07)**

B) Find the convolution $f(t)$ of the two functions $f_1(t)$ and $f_2(t)$ which are given as **(08)**

$$f_1(t) = \begin{cases} 1; |t| < 1 \\ 0; |t| > 1 \end{cases} \text{ and } f_2(t) = \begin{cases} 1; |t| < \frac{1}{2} \\ 0; |t| > \frac{1}{2} \end{cases}$$

OR

B) Calculate fourier transform of the following **(08)**

[1] $e^{-3|t-1|}$

[2] $\delta(t+2) + \delta(t) + \delta(t-1)$

Q.4 A) Explain classifications of signals in detail. **(07)**

OR

A) Determine the inverse fourier transforms of the following. **(07)**

[1] $\sum_{l=-\infty}^{\infty} \left\{ 2\pi\delta(\omega - 2\pi l) + \pi\delta\left(\omega - \frac{\pi}{2} - 2\pi l\right) + \pi\delta(\omega + \frac{\pi}{2} - 2\pi l) \right\}$

[2] $cos^2\omega + sin^2\omega$

B) Determine the inverse z-transform of the function **(08)**

$$F(z) = \frac{1}{z^2 - 1.2z + 0.2}$$