

**FACULTY OF ENGINEERING**  
**B.E. (CSE, CME, DS, IT) IV- Semester (AICTE) (Main) (New) Examination,**  
**September/October 2022**

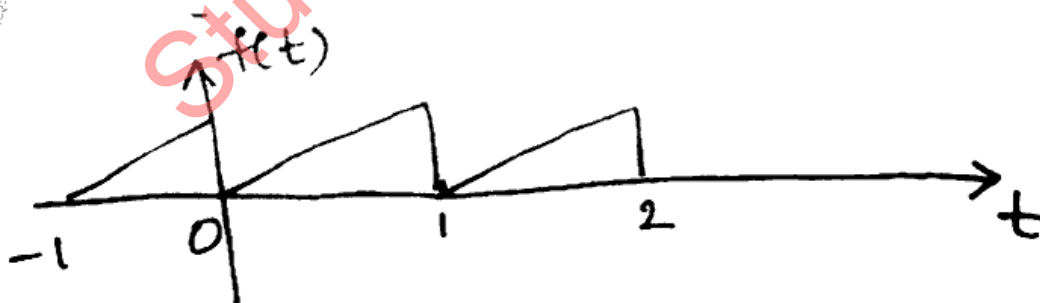
**Subject: Signals & Systems**

**Time: 3 Hours**

**Max. Marks: 70**

- Note:** (i) First question is compulsory and answer any four questions from the remaining six questions. Each Questions carries 14 Marks.  
(ii) Answer to each question must be written at one place only and in the same order as they occur in the question paper.  
(iii) Missing data, if any, may be suitably assumed

1. (a) Test if the signal  $x(t) = 30 \sin 300\pi t + 300\pi \cdot \cos 20\pi t$  is periodic or not. If periodic, find the time period
  - (b) Determine whether  $x(t) = A \cos(\omega t + \theta)$  is an energy signal or a power signal.
  - (c) State Dirichlet's conditions for Fourier series of a continuous time periodic signal.
  - (d) Find Fourier transform of constant A.
  - (e) Obtain the Laplace transform of  $\sin u(t)$ .
  - (f) Find the Z transform of  $x[-n]$
  - (g) The impulse response of system is given by  $h[n] = \{1, 2\}$  &  $x[n] = \{5, 2\}$ . Determine  $y[n]$ .
2. (a) state and prove the stability condition for an LTI system.
  - (b) Explain the basic operations that can be performed on continuous time signals.
3. (a) Find the Trigonometric Fourier series of the periodic signal given below.



- (b) Check the orthogonality of the two signals  $e^{2j\omega t}$  and  $e^{-2j\omega t}$  over the interval  $[0, T]$
4. (a) Find the Fourier transform of the signum function.
  - (b) Find the Laplace transform and the associated ROC for the signal  $x(t) = e^{-2t} [u(t) - u(t - 5)]$ .

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5. (a) Check the stability of the following system
- $h(n) = 2^n u(n)$
  - $y(n) = ax(n-7)$
- (b) Comment about linearity, causality and time invariance of the system given  $y(n) = 2x(n-1)^2$
6. (a) State the properties of Cross Correlation.
- (b) Obtain the graphical convolution of the functions  $f_1(t) = e^{-2t} u(t)$  and  $f_2(t) = u(t)$ .
7. (a) Obtain the z-transform and the associated ROC for the sequence  $x(n) = na^n u(n)$ .
- (b) Determine the initial and final values of  $x(n)$ , given  $\frac{z^2}{2z^2 - 3z + 1}$ ,  $|z| > 1$ .

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