

BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(MID SEMESTER EXAMINATION SP/2023)

CLASS: BTECH
BRANCH: ECE

SEMESTER : IV
SESSION : SP/2023

SUBJECT: EC251N SIGNALS AND SYSTEMS

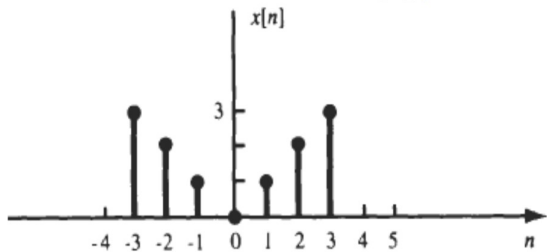
TIME: 02 Hours

FULL MARKS: 25

INSTRUCTIONS:

1. The question paper contains 5 questions each of 5 marks and total 25 marks.
2. Attempt all questions.
3. The missing data, if any, may be assumed suitably.
4. Tables/Data handbook/Graph paper etc., if applicable, will be supplied to the candidates

- Q.1(a) Define a signal and its periodicity. Find the period of the signal $x[n] = \cos\left(\frac{\pi n}{4}\right) + \sin\left(\frac{\pi n}{8}\right) - 3\cos\left(\frac{\pi n}{2}\right)$ [2] CO1 BL1
- Q.1(b) A discrete time signal $x[n]$ is shown below. Sketch the signal $x[n]\{u(n+2) - u(n)\}$ [3] CO1 BL2



- Q.2(a) State causality and time invariance of a system. [2] CO1 BL1
- Q.2(b) The system having input $x[n]$ related to output $y[n]$ as $y(n)=\log(|x[n]|)$. Check the causality, linearity and stability of the system. [3] CO1 BL2
- Q.3(a) Find the Convolution of the discrete sequences: $h[n]=\{1,2,-1,3\}$ and $x[n]=h[n]$. [2] CO2 BL2
- Q.3(b) Derive the impulse response $h(t)$ of the LTI system for the input $x(t)$ and the output $y(t)$ as given below. [3] CO2 BL2

$$x(t) = e^{-2t} u(t), y(t) = e^{-t} u(t)$$

- Q.4(a) State the Dirichlet condition for the convergence of Fourier Series. [2] CO3 BL2
- Q.4(b) The step response $s[n]$ of an LTI system is given as $[n] = \alpha^n u[n]$ $0 < \alpha < 1$. Find the impulse response $h[n]$ of the system. [3] CO2 BL3
- Q.5(a) Define state and state space representation of system. [2] CO3 BL2
- Q.5(b) Find the state transition matrix of the following electrical circuit. [3] CO3 BL3

