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

CLASS: BTECH   SEMESTER: VII
BRANCH: ECE   SESSION: MO/2022

SUBJECT: EC445 INTRO. TO SIGNAL PROCESSING

TIME: 2 HOURS   FULL MARKS: 25

INSTRUCTIONS:
1. The total marks of the questions are 25.
2. Candidates attempt for all 25 marks.
3. Before attempting the question paper, be sure that you have got the correct question paper.
4. The missing data, if any, may be assumed suitably.
5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.

			CO	BL

Q1 (a) What is a 'Signal'. Define continuous and discrete signals along with the graphical representations. [2] CO1 1

Q1 (b) A continuous-time signal x(t) is shown in Fig. 1. Sketch and label each of the following signals: (a) $x(t-2)$; (b) $x(2t)$; (c) $x\left(t/2\right)$; (d) $x(-t)$. [3] CO1 3
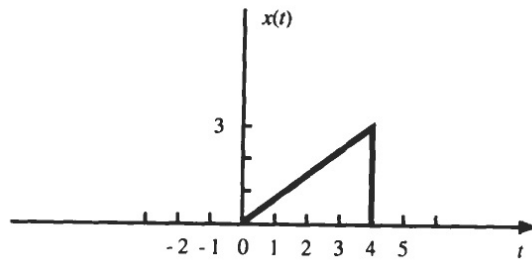

Fig. 1.

Q2 (a) Explain energy and power signals along with the expressions for the signal energy and signal power. [2] CO1 2

Q2 (b) Determine whether the following signals are energy signals, power signals, or neither. [3] CO1 3
(a) $x(t) = e^{-at}u(t)$, $a \geq 0$, $u(t)$ is the unit step signal
(b) $x(t) = A\cos\left(\omega_0 t + \theta\right)$

Q3 (a) Define the following signals: [2] CO1 1
(a) Unit impulse signal
(b) Unit step signal
(c) Unit ramp signal

Q3 (b) Explain the relationships between the above three signals. [3] CO1 2

Q4 (a) Let $x_1(t)$ and $x_2(t)$ be periodic signals with fundamental periods T_1 and T_2, respectively. Under what conditions is the sum $x(t) = x_1(t) + x_2(t)$ periodic. [2] CO1 4

Q4 (b) Assuming the condition in part (a) for periodicity is satisfied, what is the fundamental period of $x(t)$? [3] CO1 3

Q5 (a)
Let $u(t)$ be the unit step signal. Show that $u(-t) = \begin{cases} 0 & t>0 \\ 1 & t<0 \end{cases}$ [2] CO1 2

Q5 (b) A continuous-time signal $x(t)$ is shown in Fig. 2. Sketch and label the following   [3] CO1 3
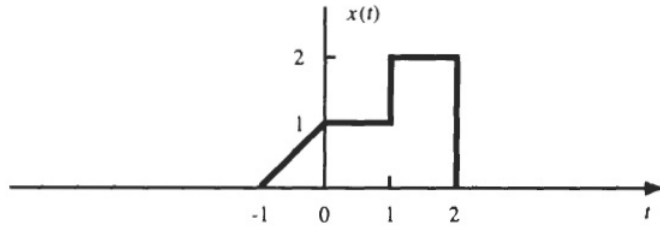signals: $x(t)\,u(1-t)$

Fig. 2

:::::: 30/09/2022 ::::::M