Indian Institute of Technology Kharagpur
Class Test IV 2024-25

Date of Examination: 8 Apr, 2025 **Duration:** 15 Minutes
Subject No.: CS60050 **Subject:** Machine Learning
Department/Center/School: Computer Science **Credits:** 3 **Full marks:** 20

Name: _____

Roll Number: _____

Question:	1	2	Total
Points:	10	10	20
Score:			

Write the answers in the space provided after the questions only.

1. (10 points) What will be the output when you convolve the following input image with the kernel (3D Tensor) $\begin{bmatrix} 0 & 1 & 0 \\ 1 & 0 & 1 \\ 0 & 1 & 0 \end{bmatrix}; \begin{bmatrix} 0 & 1 & 0 \\ 1 & 0 & 1 \\ 0 & 1 & 0 \end{bmatrix}$:

Input Image (3D Tensor): $\begin{bmatrix} 1 & 1 & 1 & 1 & 1 \\ 1 & 1 & 1 & 1 & 1 \\ 1 & 1 & 1 & 1 & 1 \\ 1 & 1 & 1 & 1 & 1 \\ 1 & 1 & 1 & 1 & 1 \end{bmatrix}; \begin{bmatrix} 1 & 1 & 1 & 1 & 1 \\ 1 & 1 & 1 & 1 & 1 \\ 1 & 1 & 1 & 1 & 1 \\ 1 & 1 & 1 & 1 & 1 \\ 1 & 1 & 1 & 1 & 1 \end{bmatrix}$

Solution:
$\begin{bmatrix} 8 & 8 & 8 \\ 8 & 8 & 8 \\ 8 & 8 & 8 \end{bmatrix}$

2. (10 points) Consider the following neural network:
$h_1 = ReLu(w_{11}x)$, $h_2 = ReLu(w_{12}x)$, and $y = ReLu(w_{21}h_1 + w_{22}h_2)$, where the input is x, output is y, and w_{ij} are the parameter values. Write the values of $[w_{11}, w_{12}, w_{21}, w_{22}]$ which makes this neural network implement the function $y = |x|$.

Solution:
$[1, -1, 1, 1]$

Rough space