National University of Computer and Emerging Sciences, Lahore Campus

Course:	Artificial Intelligence	Course Code:	AI2002
Program:	BS(Computer Science)	Semester:	Spring 2024
Duration:	30 minutes	Total Marks:	15
Date:	12-05-24	Weight	3.33%
Section:	N	Page(s):	
Quiz:	5		

Instruction:

- **Understanding the question is also part of the quiz, so do not ask for any clarification. Make suitable ASSUMPTIONS in case of any issues.**
- **No leniency on plagiarism.**
- **Cutting will result in zero marks.**

Question 1:

a) **Suppose you are given with a 1024*1024 image and 5 layers of convolution+pooling are applied before fully stacked neural network. Compute weight and biases at each level and dimensions of resultant matrix. Consider stride size is 2 throughout. Pooling window size is also 2 by 2 (except last cell, it uses its own pooling window size and stride). You can use this formula to compute after pooling dimensions:** **12 Marks**

(Input image width – filter image width)*(1/stride)+1

Weights are number of elements in each filter while for each filter there is only 1 bias. For example for 4 3*3 filters weights will be 3*3*4 = 36 and biases will be 4 (1 for each filter).

Input image dim	Filter dims	No. of filters	Weights,biases	Resultant image	After pooling
1024*1024*1	3*3	4	3*3*4= 36, 4	Floor(511.5)= 511*511*1*4	Floor(255.5)= 255*255*4
255*255*4	2*2	2	2*2*2=8,2	127.5=127	63
63*63*2	2*2	1	2*2*1=4, 1	31	15
15*15*1	2*2	4	2*2*4=16, 4	7, 4	3
3*3*2	1*1	2	2, 2	2	Pooling filter= 1*1 and stride=1

b) **After this a fully connected Neural network is implemented which uses extracted features of above layers. 2 hidden layers and 1 output layer is attached. Hidden layer 1 has 32 neurons while hidden layer 2 has 15 neurons and model is used to perform multi classification between 10 classes. Softmax is applied at output layer. What will be the dimensions of weight matrices (excluding biases) between all layers?** **3 Marks**