Manarat International University (MIU)

Department of Computer Science and Engineering
Mid-term Examination (Fall 2019)
Computer Vision and Robotics (CSE-437)

Full Marks: 30   Time: 1.5 Hour

Answer any 6 (Six) questions. All questions are of equal value.

1   a. Write the challenges of image recognition in Computer Vision.   2 + 3

    b. Mention four limitations of using **K-Nearest Neighbors** in image recognition.

2   a. Why do we need **Regularization**?   3 + 2

.

    b. Write an equation for loss function for a linear classifier with **softmax loss** and **L2 regularization.**

3   a. Why do we need negative gradient for optimizing loss function.   2 + 3

    b. Write a function using any programming language to implement **Stochastic Gradient Descent**.

4   a. Explain **1x1 convolution** in a CNN network.   2 + 3

    b. Why do we use **padding ?** What is the role of pooling layers in a CNN.

5   a. How does weight regularization prefer simpler models in machine learning.   3 + 2

    b. Write down the vectorized implementation of **Multiclass SVM Loss.**

6   Aminul Islam develops a linear classifier to classify 4 image categories. Calculate the **Multinomial**   5
    Logistic Regression loss of this network for the input image shown below.

Input Image	Score	Class Label
	-3.44	Dog
	0.16	Cat
	1.81	Boat
	1.91	Airplane

7   Consider the convolutional network defined by the layers in the left column below. Fill in the size of   5
    the activation volumes at each layer, and the number of parameters at each layer.

    You can write your answer as a multiplication (e.g. 100x100x3).

- CONV5-N denotes a convolutional layer with N neurons, each having 5x5xD filters, where D
  is the depth of the activation volume at the previous layer. Padding is 2, and stride is 1.
- POOL2 denotes a 2x2 max-pooling layer with stride 2 (pad 0)
- FC-N denotes a fully-connected layer with N neurons.

Layer	Activation Volume Dimensions (memory)	Number of parameters
INPUT	64x64x1	0
CONV5-10		
POOL2		
CONV5-10		
POOL2		
FC-10		