

# Manarat International University (MIU)

Department of Computer Science and Engineering

Mid-term Examination (Spring 2019)

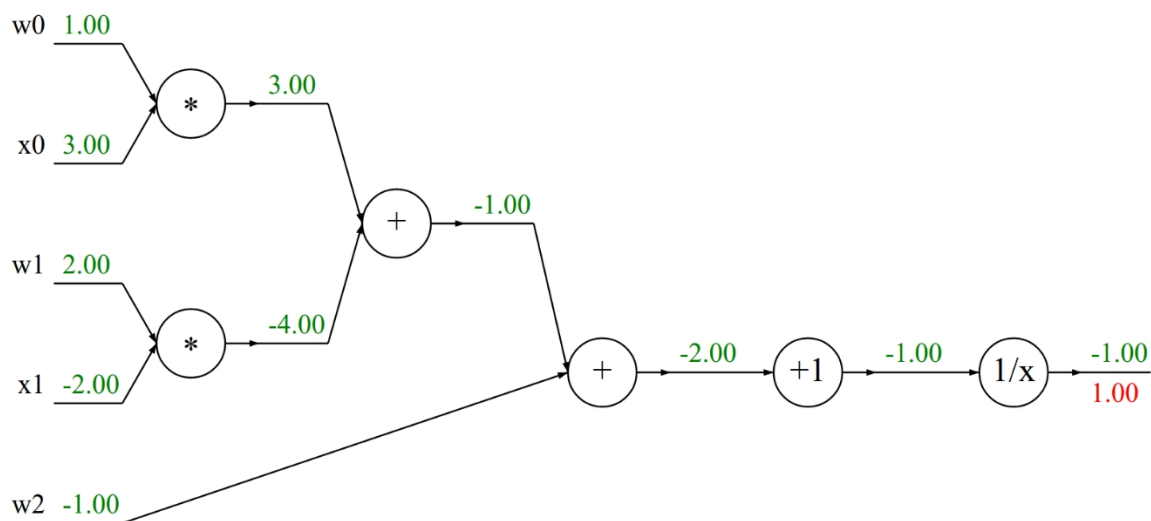
Computer Vision and Robotics (CSE-437)

Full Marks: 30

Time: 1.5 Hour

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

1. Fill in the missing gradients underneath the forward pass activations in the following computational graph. 5



2. Write the challenges of image recognition in computer vision. Mention four limitations of using K-Nearest Neighbors in image recognition. 2 + 3
3. Define Softmax function. Why we take Negative Log-Likelihood (NLL) to calculate categorical cross-entropy loss. 2 + 3
4. Why do we need regularization? Write an equation for loss function for a linear classifier with softmax loss and L2 regularization. 3 + 2
5. Why do we need negative gradient for optimizing loss function. Write a function using any programming language to implement Stochastic Gradient Descent (SGD). 2 + 3

- 6 Tiyamum Foyraz develops a linear classifier to classify 4 image categories. His network gets following scores for the input image shown below. Calculate the *Multiclass SVM loss* and *Multinomial Logistic Regress loss* for this network. 5

Input Image	Score	Class Label
	-3.44	Dog
	1.16	Cat
	0.81	Boat
	1.91	Airplane

- 7 Write True or False for the following question. 5

- a) If the input to a network is a zero image (all zeros), then the class probabilities will come out uniform.
- b) Turning off L2 weight regularization will likely lead to higher accuracy on the training set.
- c) During back-propagation, as the gradient flows backwards through any of sigmoid non-linearity, it cannot change sign.
- d) The loss function will always decrease after a parameter update when performing Vanilla Gradient Descent on the full objective (no mini-batches).
- e) The derivative of the loss with respect to some weight in your network is -3. That means that decreasing this weight (by a tiny amount) would decrease the loss.