Artificial Intelligence
QUIZ 2 (Section-B)

Date: October 31, 2018 **Marks: 50** **Time: 30 min.**

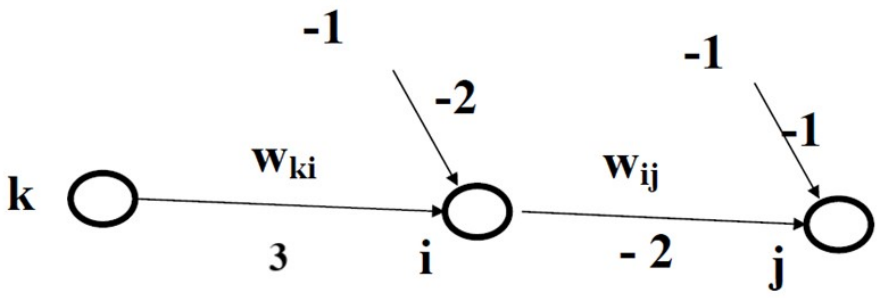
Q1. a. Suppose we want to implement a Boolean function X1 ∧ ¬X2 ∧ X3 with a single neuron. Calculate the appropriate threshold assuming the weights to be W1 = 1, W2 = -2 & W3 = 1. The truth table of the function is given below. (10)

Truth Table

X_1	X_2	X_3	$X_1 \wedge \neg X_2 \wedge X_3$
0	0	0	0
0	0	1	0
0	1	0	0
0	1	1	0
1	0	0	0
1	0	1	1
1	1	0	0
1	1	1	0

b. What would be the bias weight for this problem, if bias (with a constant input of -1) is used instead of threshold? (5)

Q2. For the following network, find the new weight wki (new) by the delta rule. Activation Functions of both neurons "i" and "j" are linear, i.e. y = activation. The learning rate is 0.1. The training pair is [2; 3]; i.e. input = 2 and output = 3. The current weights are shown on the links. There is only one input "k" and only one output "j". The hidden layer has one neuron "i". The node "k" is not a neuron and just passes on the input without any processing or modification. (25)



Given Data/Hint:
According to the generalized delta rule, the hidden weight change is governed by:
Δwki = wki(new) – wki(old)
Δwki = -c[-2Σj {(yj(desired) – yj(actual)) f'(act)j wij }f'(act)i xk]
For the above problem, there is only one output neuron (i.e. "j" = 1). Hence the Equation becomes
wki(new) = wki(old) -c[-2Σj {(yj(desired) – yj(actual)) f'(act)j wij }f'(act)i xk]
We have the following given values:
wki(old) = 3, c = 0.1, yj(desired) = 3, wij = -2, xk = 2

Q3. Represent the following as a GP tree. [e raise to power –(λ*A)] (10)

Equation: $Y = [2 / \{1 + e^{-(\lambda * A)}\}] - 1$

Where A = (W1 * X1) + (W2 * X2). The Wi, Xi, and λ are variables