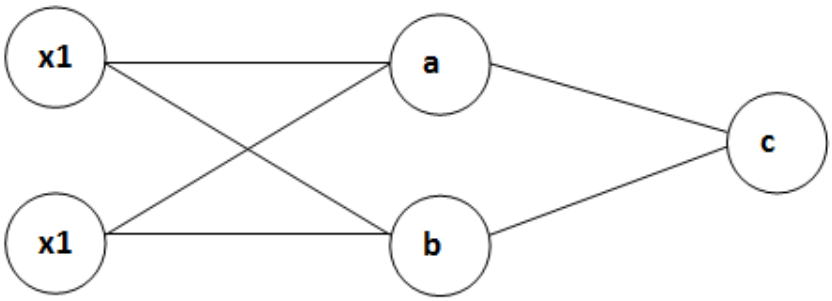
National University of Computer and Emerging Sciences, Lahore Campus

Course:	Artificial Intelligence	Course Code:	AI-2002
Program:	BS(Computer Science)	Semester:	Spring 2023
Duration:	30 Minutes	Total Marks:	10
Paper Date:	28-March-23	Weight	3.33 %
Section:	C/D	Page(s):	1
Exam:	Quiz 2	Roll No.	

Instruction/Notes:

- There are 2 questions. Attempt all questions.
- Provide your solution on this sheet. You may use an extra page for rough work.



X1	X2	OP
0	0	0
0	1	0
1	0	0
1	1	1

All **weights** are **0.5**, all **bias** are **1**, the **learning rate** is **0.1**, and **activation** function is **sigmoid**

Problem#1 - Forward Propagation (CLO-2)

a) Calculate and write hidden layer outputs
(inputs x weights_h) +bias_h

- `[[1.  1. ]`
- `[1.5 1.5]`
- `[1.5 1.5]`
- `[2.  2. ]]`

b) Calculate and write hidden layer activations
g(output_h)

- `[[0.73105858 0.73105858]`
- `[0.81757448 0.81757448]`
- `[0.81757448 0.81757448]`
- `[0.88079708 0.88079708]]`

c) Calculate and write output layer results
(activation_h x weights_o) + bias_o

- `[[1.73105858]`
- `[1.81757448]`
- `[1.81757448]`
- `[1.88079708]]`

d) Calculate and write output layer results after activations g(output_o)

- [[0.84954777]
- [0.86027483]
- [0.86027483]
- [0.86770265]]

e) Calculate the error at output layer expected_output - activations_o

- [[-0.84954777]
- [-0.86027483]
- [-0.86027483]
- [0.13229735]]

Problem#2 - Back propagation(CLO-2)

a) Calculate and write delta of output layer E * g'(activations_o)

- [[-0.1085861]
- [-0.1034068]
- [-0.1034068]
- [0.01518704]]

b) Calculate and write delta of hidden layer delta_output x weights_o.T * g'(activations_h)

- [[-0.01067466 -0.01067466]
- [-0.00771138 -0.00771138]
- [-0.00771138 -0.00771138]
- [0.00079727 0.00079727]]

c) Update the weights of output layer weights_o += activations_h.T x (delta_output) *lr

- [[0.47649084]
- [0.47649084]]

d) Update the weights of hidden layer inputs.T x delta_hiddenlayer *lr

- [[0.49930859 0.49930859]
- [0.49930859 0.49930859]]

e) Update the bias of output layer bias_o += sum(delta_hidden) * lr

- [[0.96997874]]