Answer the following questions:

Q1: [8 Marks]

For the following table, find the ***equation*** between y and x using ***least squares***. Then, ***predict*** the output y if $x=3.5$.

Input x	2	3	4	5
Output y	1	3	6	7

Q2: [8 Marks]

Find the ***eigenvalues*** and ***eigenvectors*** of the matrix $\boldsymbol{A} = \begin{bmatrix} 2 & 3 \\ 3 & 2 \end{bmatrix}$.

Q3: [8 Marks]

For the tables S1 and S2, ***Find***:

a- $\pi_{\text{Name,Rating}}\ (\ \sigma_{\text{Rating} > 8}\ (\text{S2})\ )$.
b- S1 ∩ S2.
c- S1 U S2.
d- S1 – S2.

S1			
SID	Name	Rating	Age
22	Ahmed	7	45
31	Ali	8	55
58	Salem	10	35

S2			
SID	Name	Rating	Age
28	Omar	9	35
31	Ali	8	55
44	Jamal	5	35
58	Salem	10	35

Good Luck

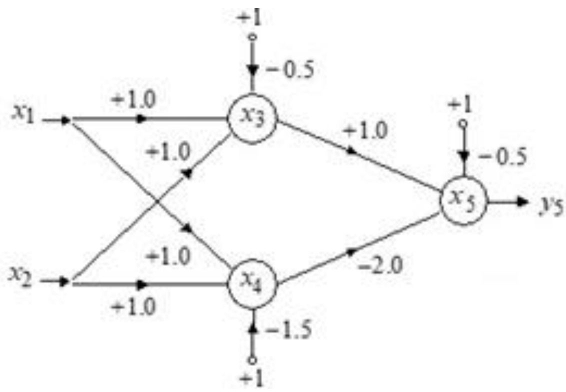
كلية التقنية الالكترونية
College of Electronic Technology - Tripoli

القســـم: حاسب آلي　　　أسئلة الامتحان النهائي لمادة: الجبر الخطي
الفصل: الرابع　　رمز المادة: GS202　　التاريخ: 15/ 06 /2023م
الفصل الدراسي : ربيع 23　　الزمن: ساعتان
اسم الطالب :..　　رقم القيد ....

Q4: [8 Marks]

Complete the shown table, for the following Neural Network, where the ***threshold*** value $\boldsymbol{\theta = 0}$.

X_1	X_2	X_3	X_4	$X_5 = y_5$
0	0			
0	1			
1	0			
1	1			



Q5:

a- ***Solve*** the following equations:

$$2x_1 - 4x_2 + 2x_3 = 0$$
$$x_1 + 3x_2 - x_3 = 8$$
$$5x_2 - 2x_3 = 8$$

[4 Marks]

b- ***Find*** α, β to make the vectors $\mathbf{a} = \alpha\,[1 \;\; 1]^T$ and $\mathbf{b} = \beta\,[1 \;\; -1]^T$ ***orthonormal basis***. Then, find the orthonormal ***expansion of*** the vector $\mathbf{c} = [4 \;\; -2]^T$ in the above orthonormal basis. [4 Marks]

Good Luck