National University of Computer & Emerging Sciences, Karachi
Spring 2023
School of Computing
Midterm-II Examination
10th April 2023, 08:15 am – 09:15 am

Course Code: CS4053 / AI4006	**Course Name:** Recommender Systems
Course Instructor: Syed Zain Ul Hassan	
Student ID:	**Section:**

Instructions:

- Return the question paper after exam.
- There are **3 questions** on **1 page** with **2 sides**.
- In case of any ambiguity, you may make assumption. But your assumption should not contradict any statement in the question paper.

Time: 60 minutes **Max Marks**: 30 Points

Question 1 (CLO: 2)	**12 points**

For the following **3 x 5** interaction matrix, answer the questions given below:

	Item 1	Item 2	Item 3	Item 4	Item 5
User 1	3	1	1	3	1
User 2	1	2	?	1	3
User 3	4	3	5	4	4

a) Do these two matrix factors correctly represent the original interaction matrix? Provide a reason.

	F1	F2
U1	1	0
U2	0	1
U3	0	1

	I1	I2	I3	I4	I5
F1	3	1	1	3	1
F2	1	2	4	1	3

b) Use the matrix factors provided in Part (a) to predict missing rating $R(U2, I3)$.
c) How much storage space does the original interaction matrix require? Compare it with the total storage space required by the two given factors and write your comments about it.
d) Re-initialize the matrix factors in Part (a) with different arbitrary values in range [0.1—0.9] and calculate the sum of all squared errors.

Question 2 (CLO: 1) **12 points**

a) Consider the given table depicting the features of laptops available for purchase.

	HD Display	RAM (*GB*)	Storage (*GB*)	Price (*k*)
L1	Yes	4	512	52
L2	No	8	1020	80
L3	Yes	16	1020	96

Use case-based knowledge driven technique to recommend the most suitable laptop for the following user requirements:

HD Display	RAM (*GB*)	Storage (*GB*)	Price (*k*)
No	16	512	60

Note: Assume all attribute weights to be 1.

b) List down some limitations of constraint-based systems.

Question 3 (CLO: 1) **6 points**

Consider the case where the data points are linearly separable. What will be the role of activations in a neural network architecture with an input layer, several hidden layers and an output layer?

Good luck!