National University of Computer & Emerging Sciences, Karachi
Fall 2023
School of Computing
Midterm-I Examination
25th September 2023, 08:30 am – 9:30 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: 1)	(2 x 5) 10 points

Provide brief answers for the following and justify:

a) How does lack of personalization affect serendipity in a recommender system? Can we control serendipity in user-based Collaborative Filtering?

b) What is the advantage of using a mean-centered prediction function over an origin-centered function?

c) Let us say that we have a photo sharing app. The app allows us to *like* or *dislike* the photos shared by people we are connected with. To implement a recommender system for this app, which one of the techniques covered so far in the course would be most suitable? Justify your selection.

d) Can content-based recommender systems solve cold-start problem if a new user is added?

e) Assume that an active user has m unrated items in a system of n total items. And the total number of users are represented by k. Should we use either user-based filtering or item-based filtering in case the value of k is much less than m? Provide a reason.

Question 2 (CLO: 1)	10 points

Consider the following data:

	Features	Rating
	Comfort, Daily Use	2
	Health, Daily Use	?
	Travel, Health, Daily Use	5
	Comfort, Health	?

The active has rated items chair and bicycle, while water bottle and gloves are unrated. Based on the given features of these items, which one of the two unrated items will be recommended to the user?

Note: The allowed values for ratings are 1, 2, 3, 4 and 5.

Question 3 (CLO: 1)   10 points

Consider the given interaction matrix:

	Attack on Titan	My Hero Academia	Code Geass	Vinland Saga
User 1	5	3	3	
User 2	4	2	3	3
User 3	5	?	4	2
User 4	1	5	4	3

a) Assume *User 3* to be active user and find their Pearson Correlation with all other users.
b) Predict the missing rating *R*(U3, I2) using mean-centered prediction function for **k=2**.

$$R_U = \overline{r_a} + \frac{\sum_{b \in N} sim(a, b) * (r_{b,p} - \overline{r_b})}{\sum_{b \in N} sim(a,b)}$$

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Good luck!
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