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National University of Computer and Emerging Sciences, Lahore Campus



Course:	Database Systems	Course Code:	CS2005
Program:	BS(CS, DS, SE)	Semester:	Spring 2024
Duration:	60 Minutes	Total Marks:	35
Paper Date:	28-Feb-2024	Weight	15%
Section:	ALL	Page(s):	5
Exam:	Midterm-I		

Instruction/Notes:

All the questions should be solved on the question paper. You will not get any credit if you do not show proper working, reasoning, and steps as asked in the question statements.

Consider the following simplified database schema for a forum post system like *Stack Overflow*. A forum post system is an online platform where users can discuss by posting messages. Users can create new posts or reply to existing posts.

In the DB schema given below:

- The Post table stores information about forum posts. The AuthorID is the ID of the User who created the post.
- The User table stores information about users.
- The Reply table stores replies to forum posts. A user can write a reply to an existing reply, meaning that replies are hierarchical and can be organized into parent-child relationships. Each reply can have zero or more replies, and each reply is associated with a parent reply. The column ParentReplyID indicates the parent reply to which the current reply is a response. If a reply is a direct response to the main post, then the "ParentReplyID" is NULL.

<pre>CREATE TABLE Post (PostID INT PRIMARY KEY, Title VARCHAR(255), Content TEXT, AuthorID INT, CreatedAt DATETIME);</pre>	<pre>CREATE TABLE Reply (ReplyID INT PRIMARY KEY, PostID INT, ReplyText TEXT, AuthorID INT, ParentReplyID INT, CreatedAt DATETIME);</pre>	<pre>CREATE TABLE User (UserID INT PRIMARY KEY, Username VARCHAR(50), Email VARCHAR(100), Gender CHAR(1));</pre>
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Q.1 (4 points) Add referential integrity constraints: "On Delete cascade" and "On Update Cascade" to the foreign keys in the POST, REPLY, and USER tables.

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Q.2 (15 points) Specify the following queries in *SQL*

a. List the IDs and Names of the Female **Users** who have not created any posts.

b. Print IDs of the **Replies** that have received two or more replies.

c. List the usernames of users who have replied to their posts.

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Consider the following database state.

User table:

UserID	UserName	Gender	Email
1	Alice	Female	alice@example.com
2	Bob	Male	bob@example.com
3	Charlie	Male	charlie@example.com

Post table:

PostID	Title	CreatedAt	AuthorID	Content
1	Introduction	2024-02-20	1	Welcome to our platform!
2	Tips and Tricks	2024-02-21	2	Here are some tips for you.
3	Question about AI	2024-02-22	3	I have a question about AI.
4	Programming Question	2024-02-23	1	I need help with programming.
5	Data Science	2024-02-24	2	Let's discuss data science.

Reply table:

ReplyID	PostID	AuthorID	ParentReplyID	ReplyText	CreatedAt
1	1	2	NULL	Welcome, Alice!	2024-02-20
2	1	1	NULL	Thanks, Bob!	2024-02-21
3	1	3	1	Hello, everyone!	2024-02-22
4	1	2	2	Hi, Alice!	2024-02-22
5	2	1	NULL	Great tips, Bob!	2024-02-21
6	2	3	5	I agree!	2024-02-22
7	3	2	NULL	Can someone help me?	2024-02-22
8	3	1	NULL	Sure, what's up?	2024-02-22
9	3	3	7	What do you need help with?	2024-02-22

Q3. (9 points) Consider the above database state and give the output tuples generated after running the following queries. Also, explain in ONE sentence what these queries do

- a) SELECT u.UserName AS name, p.Title AS title, r.ReplyText AS text
 FROM (User u JOIN Post p ON u.UserID = p.AuthorID) JOIN Reply r ON p.PostID = r.PostID
 WHERE p.Title <> 'Introduction' AND r.ParentReplyID IS NULL;

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- b) SELECT p.PostID AS ID, p.Title AS title, u.UserName AS name, COUNT(r.ReplyID) as CountR
FROM (Post p LEFT JOIN User u ON p.AuthorID = u.UserID) LEFT JOIN Reply r ON p.PostID = r.PostID
GROUP BY p.PostID, p.Title, u.UserName
ORDER BY CountR DESC;
- c) SELECT UserID, UserName, COUNT(*) as Countp
FROM User u JOIN Post p ON u.user_id = p.author_id
GROUP BY UserID, UserName
HAVING COUNT(*) > 1
ORDER BY UserID desc, UserName desc, Countp DESC;

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Q.4 (4 points) Considering the constraints applied on the schema in (Q1) and **database state** given in (Q3).

Apply the following operations on the above database. State if the operation would be carried out successfully or not. In case of successful operation, indicate the changes that will be made to the above database, clearly specify the name of the table and change. Also, state all the integrity constraints violated by each operation, if any. Please note that **all operations are independent**.

1. DELETE FROM User WHERE username='Bob';

2. INSERT INTO reply VALUES (10,6,' hello',3,NULL,' 2024-02-13');

3. UPDATE post SET postId=7 WHERE title='introduction';

4. DELETE FROM post WHERE postId=4;