COMSATS UNIVERSITY ISLAMABAD (CUI)

DEPARTMENT OF COMPUTER SCIENCE
MID-TERM EXAMINATION SPRING - 2024
BS(DS)-IV SEMESTER

Course: CSC270 -Database Systems
Maximum Marks: 25
Instructor name: Zahid Anwar

Date: April 18, 2024
Time Allowed: 90 Minutes

- *All questions are self-explanatory and require no further explanations during exam time.*
- *Make sure that you have signed the attendance sheet before leaving the examination room.*
- ***Return the question paper along with the answer sheet.***
- *Attempt all questions.*

[CLO1: Explain database concepts and principles]

Question No. 1: Suppose you are designing a web-based application for an online bookstore. The application allows users to browse books, add them to their cart, and make purchases. Describe how you would implement a three-tier architecture for the online bookstore application. Provide details on each tier and explain their respective roles in the system. **[4.5 Marks]**

[CLO2: Apply the concept of domain and tuple relational calculus]

Question No. 2: For the following scenario, you are to write relational algebra queries, against the following needs, over a small sample database. The database contains the following 4 relations. **[7*1.5=10.5 Marks]**

Student(sid: integer, sname: string)

Course(cid: string, iid: integer, cname: string)

Instructor(iid: integer, iname: string,)

Grades(sid: integer, cid: string, grade: string)

Note: Most of the queries can be written in many ways.

2.1. Find the name of the students who have registered in the course with cid CS44800.

2.2. Find the ids of the courses taught by at least two different instructors.

2.3. Find the ids of the students who never received a grade F.

2.4. Give a list of all people (Instructors and Students), with their ID and name.

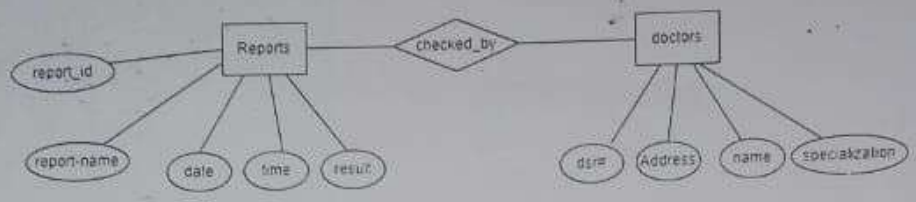
2.5. list all courses along with the instructor who teaches each course, and the average grade received by students in each course.

2.6. List all students along with their highest grade received in any course.

2.7. list all courses along with the number of students enrolled in each course.

[CLO3: Apply data modeling and normalization techniques to design database for small to medium size enterprise]

Question No. 3: Given the following Entity Relationship Diagram (ERD), modify it to include the following additional requirements. **[8 Marks]**



3.1. Introduce a new entity called 'patients' with unique identifiers, insurance status, names, and records documenting admission and discharge dates from the hospital. Determine the relationships between 'patients' and existing entities and finalize the ER diagram accordingly." [1]

3.2. Ensure that both patient and doctor addresses include details such as street number, house number and city. [0.5]

3.3. Write the database schema for the generated ERD in 3.2. [0.5]

3.4. If we aim to capture the hospitalization period of a patient spent in the hospital (POT) using their admission date and check-out date, how should we represent this within the ER model?" [0.5]

3.5. If we want to add more details with insurance number like contact number for patients, how it would be reflected in ERD. [0.5]

3.6. We intend to incorporate details regarding the availability of doctors (appointments) as an entity into the system, including recording appointment days and checkup fees." [1]

3.7. Write the database schema for the generated ERD in 3.6. [1]

3.8. The doctors can have specialization in either Surgery or Neurology. For every doctor, we need to store their did# and Appointment Hours. For Surgeons, we need to store experience in years, Success rate, for Neurologists we need to store Specialization, Appointment Hours. [1.5]

3.9. Change the ERD obtained in Part 3.6 to Enhanced ERD modeling of this requirement. [1.5]

Question No. 4: Given the following Entity Relationship Diagram (ERD), Identify if there exist any connection traps or not. If yes identify the type of connection trap and reconstruct the given ERD. **[2 Marks]**

*****BEST OF LUCK*****