In-Semester Exam-II (Winter'2024)

IT214 Database Management Systems

Time: 90 minutes Max Points: 50

IMPORTANT NOTE:
1. May use a Pencil to draw ER Diagrams.
2. Write answers neatly and cleanly. Answers that are difficult to read may simply be discarded.

Suppose we need to create an application for conducting online exams. The following is a description capturing the necessary data requirements for the proposed application.

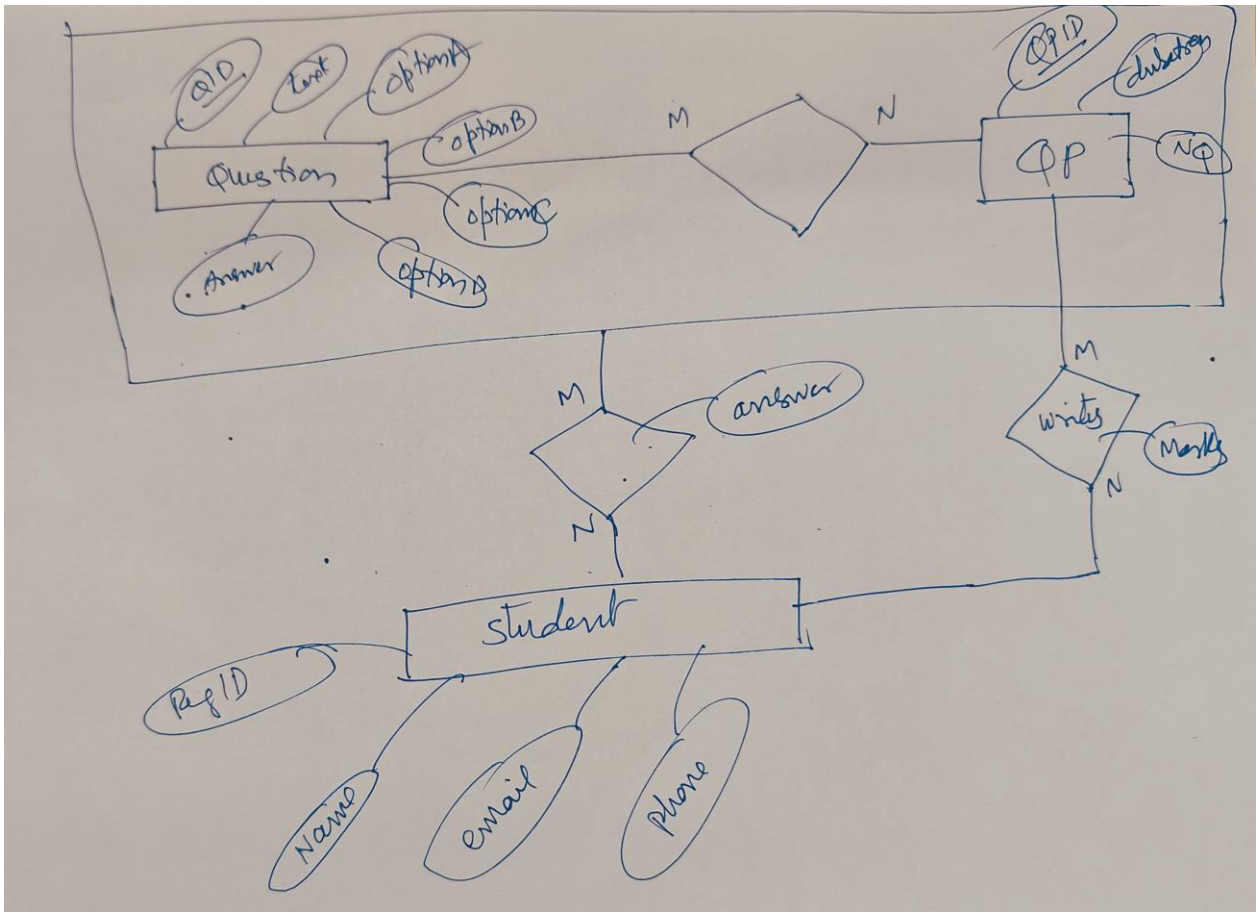
The organizers maintain a question bank. All questions of the question bank are used in conducting multiple-choice exams. Let us say each question in the question bank has a unique ID and stores question text, four options (A,B,C,D), and one (only one) correct answer (A|B|C|D).

When an exam is to be taken, a question paper for the exam is generated by randomly selecting N questions from the question bank. For each question paper, we record the exam ID, number of questions, and the duration of the exam. A number of students take the exam. Let us say we capture the RegID, Name, email, and phone of each student taking an exam. When students take an exam, their answer to each question is recorded in the database. On evaluation of answers of a student in an exam, overall marks in the exam are computed and stored in the database. Assume that a student with a single registered ID can write multiple exams.

15+10+10

Considering this requirement, answer the following three questions for the required database

1. Draw an ER diagram



2. Suggest an Appropriate Relational Schema, mentioning all candidate and foreign keys

```
Question(QID,QText,OptionA,OptionB,OptionC,OptionD,CorrectOption)
   Key: QID
Paper(QPID, duration, NQ}
   Key: QPID
Student(RegID, Name, email, phone)
   Key: RegID
QPQ(QPID,QID)
   Key: {QPID,QID}
   FKs:  QPID refers into Paper, and
         QID refers into Question
Answers(QPID,QID,RegID, student_answer)
   Key: {QPID,QID,RegID}
   FKs: {QPID,QID} refers into QPQ, and
         RegID refers into Student
Result(QPID,RegID, marks)
   Key: {QPID,RegID}
   FKs: {QPID refers into Paper, and
         RegID refers into Student
```

3. Identify Functional Dependencies and provide its minimal set

```
QID → {QText, OptionA, OptionB, OptionC, OptionD, CorrectOption}
QPID → {duration, NQ}
RegID → {Name, email, phone}
{QPID, RegID, QID} → student_answer
{QPID, RegID} → marks
```

For the following three questions, you are given a relation R and a set of FDs. In each case, you need to compute the **Minimal FD set** and **Key/Keys** of relation R. 5+5+5

4. R(ABCDE) AB → C B → AD C → D CD → E	B → AC C → DE Key: B	

5. R(ABCDEF) A → BCDE B → CDEF BCD → E	A → B B → CDEF Key: A	

6. R(ABCDEF) A → BCDE C → E F → DE	A → BCD C → E F → DE Key: AF	