Graduate Diploma in Software Engineering

Final Examination, Semester 1, 2021

ITS1012 Database Management Systems

Reading Time: 15 Minutes
Writing Time: 165 Minutes
This paper has 7 pages including this page and Any appendices.

Authorized Materials

Materials you can use during this open-book exam are usually unrestricted. Materials and resources that you might use on can include:

- Your own notes from lectures, given lecture notes, online learning resources
- Readings, reference to materials or textbooks

Instruction to students

The main restriction for an open-book assessment is that the work must be Students' own work to avoid plagiarism and collusion. See following guidance on plagiarism for further information.

- During the assessment you must not be helped by any other person to answer any questions. Collusion will be treated as an academic offence.
- DON'T use another student's work, or submit someone else's work as your own.
- DON'T pay other students or someone outside to do your work.
- DON'T use copy and paste to take text from another source. Instead you should do paraphrasing and summarizing.

If someone violates any of the terms above, all the parties who are involved in plagiarism will be given zero marks.

How can student write answers to the exam paper?

Students should write answers by using a black or blue ink pen in white A4 papers and scan (or simply take photos if they have a good camera phone) the handwritten work to a clean, small-sized, black-and-white PDF (single file) and submit to the Google Classroom.

File Name format: **<Your Full Name> - <Your Index Number>**

Submitting outside of the set time will constitute a failure.

Question 01 [Marks 20]

Part A

Explain the following terms briefly:

A. *Multivalued Attribute, Derived Attribute, Descriptive Attribute*
B. *Primary key, foreign key, Candidate Key*
C. *Domain*
D. *Entity*
E. *Relationship*
F. *Entity Set*
G. *Relationship Set*
H. *Binary (1:1, 1:M, M:M)*
I. *Unary (1:1, 1:M, M:M)*
J. *Participation Constrain*
K. *Strong Entity*
L. *Weak Entity*
M. *Associate Entity*
N. *Aggregation*
O. *Ternary Relationship*
P. *Referential Integrity Constraint*
Q. *Primary Key, Foreign key constraint*

Part B

A. Why would you choose a database system instead of simply storing data in operating system files? When would it make sense *not* to use a database system?

Part C

Answer the following questions with a few sentences (no longer than the allocated space).

A. What are the three major steps of the database design (data modelling) process? Define each by *one* sentence.
B. What types of participation constraints can you have in an E-R model? Define each by *one* sentence.

Part D

Which of the following plays an important role in *representing* information about the real world in a database? Explain briefly.

A. The data definition language.
B. The data manipulation language.
C. The data model.

Question 02 [Marks 20]

You are requested to provide a software solution to computerize the data of a publishing company. You are provided with the following information by the company.

The company records the following details about all the books they publish in their files and you are provided with the following details about their records.

A. Author of the book.
B. Date published.
C. Names and addresses of the potential customers.
D. Purchase history of the customers including dates, the book and the quantity ordered.
E. The books are categorized by their genre. Ex: Fiction, Science Fiction, Biography, Romance etc.
F. The books are maintained in a book selling chart according to the number of sales or rather according to their popularity and their position in the chart is recorded weekly.
G. The total amount of books sold and the monthly sales are clearly recorded for each book.
H. The remaining number of each book is monitored to decide to print the book again considering the remaining number and the demand for the particular book.

Draw a complete ER diagram for the above problem.

- Include the cardinality of all relationships.
- The cardinality of some relationships cannot be deduced from the above passage.
- Assume sensible values, indicate them on your diagram by placing a star next to them, and write down the question you would have to ask to determine if you are correct.
- Select one relationship from your diagram that would use the conversion rule relation to relationship relation with two foreign keys, and show how it would be represented by a table in the database.
- You should indicate any primary key and foreign key constraints.

Question 03 [Marks 20]

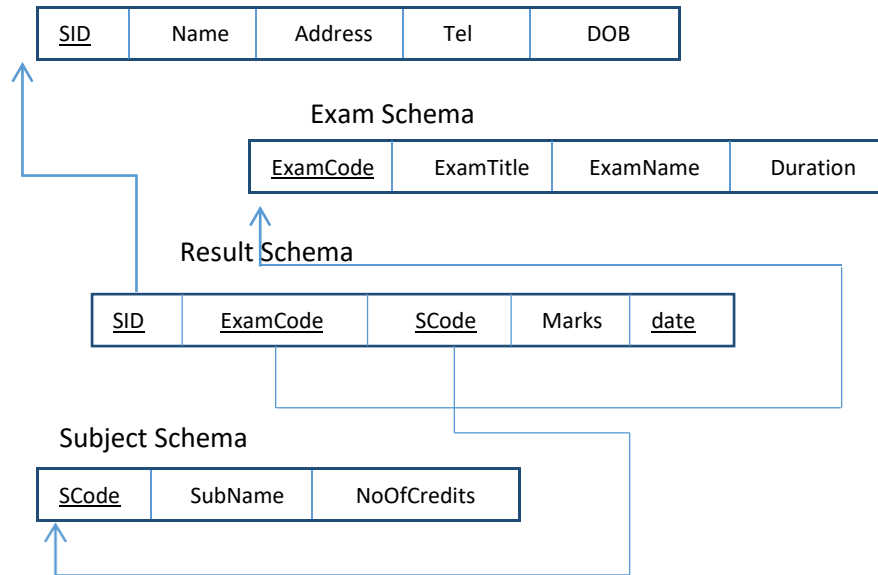1. Consider this relational schema to answer the following questions

SID	Name	Address	Tel	DOB

Exam Schema

ExamCode	ExamTitle	ExamName	Duration

Result Schema

SID	ExamCode	SCode	Marks	date

Subject Schema

SCode	SubName	NoOfCredits

Table Name	Keys
Student	PK → SID
Exam	PK → ExamCode
Result	PK → SID, ExamCode, SCode, date FK → SCode, ExamCode, SID
Subject	PK → SCode

Write SQL Queries to fulfil the following requirements (Data Definition and Data Manipulation Languages DDL, DML)

Part A

    A.   Implement above tables and set the all table constrain which is required (example primary key, foreign key, integrity, null and not null constrain).

    B.   Insert values to each table (insert one recode is enough).

    C.   Update the duration of each exam from 3 hours to 3.5 hours.

    D.   Update Kamal's telephone number to '0912244555'.

    E.   You are required to increase by 10% of the student's marks who have got below 50 or equal marks for all subjects.

    F.   Find the age of all students.

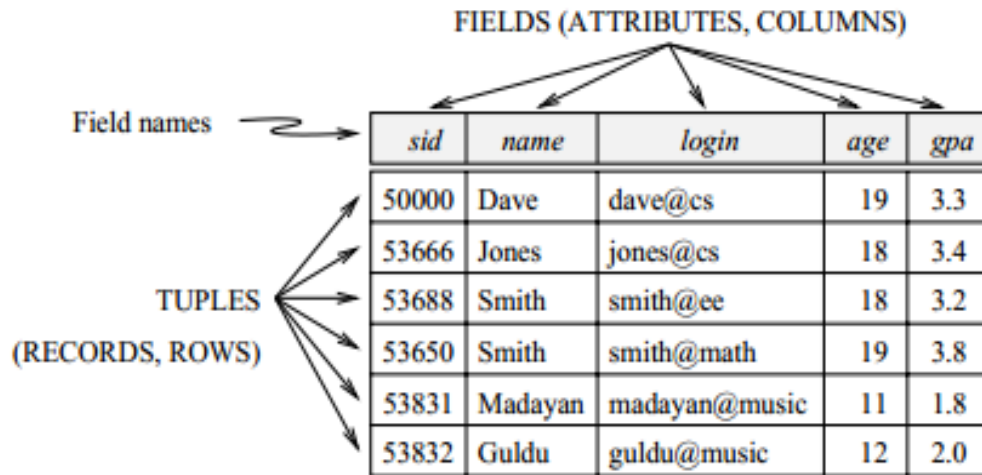   G.   Explain three different 'like' command using examples

Part B

    A.   Find all students who have born between 1985 and 1990.

    B.   Find all students who have done DBMS for the exam.

    C.   Find the average marks of each student.

    D.   Find the total marks of each student.

    E.   Find the all students who have got 130 as total marks for the all subjects.

    F.   Find the all students who have done exams from 2010-11-20 to 2010-11-26

    G.   Find the total credits of each student.

    H.   Find the best three students of the year of 2010

    I.   Find the all students who have done ABSD and AHAD.

    J.   Find the students count who have done 'development unit and programming' exam.

Question 04 [Marks 20]

Part A

What is the difference between a candidate key and the primary key for a given relation?

FIELDS (ATTRIBUTES, COLUMNS)

Field names

sid	name	login	age	gpa
50000	Dave	dave@cs	19	3.3
53666	Jones	jones@cs	18	3.4
53688	Smith	smith@ee	18	3.2
53650	Smith	smith@math	19	3.8
53831	Madayan	madayan@music	11	1.8
53832	Guldu	guldu@music	12	2.0

TUPLES
(RECORDS, ROWS)

Part B

Answer each of the following questions briefly. The questions are based on the following relational schema:

```
Emp(eid: integer, ename: string, age: integer, salary: real)
Works(eid: integer, did: integer, pcttime: integer)
Dept(did: integer, dname: string, budget: real, managerid: integer)
```

1. Give an example of a foreign key constraint that involves the Dept relation. What are the options for enforcing this constraint when a user attempts to delete a Dept tuple?

2. Write the SQL statements required to create the preceding relations, including appropriate versions of all primary and foreign key integrity constraints.

3. Define the Dept relation in SQL so that every department is guaranteed to have a manager. Write an SQL statement to add John Doe as an employee with *eid* = 101, *age* = 32 and *salary* = 15, 000.

4. Write an SQL statement to give every employee a 10 percent raise. Write an SQL statement to delete the Toy department. Given the referential integrity constraints you chose for this schema, explain what happens when this statement is executed.

5. Explain why the addition of NOT NULL constraints to the SQL definition of the Manages relation (in Section 3.5.3) does not enforce the constraint that each department must have a manager. What, if anything, is achieved by requiring that the *ssn* field of Manages be non-*null*?

Question 05 [Marks 20]

Consider the following schema:

```
Suppliers(sid: integer, sname: string, address: string)
Parts(pid: integer, pname: string, color: string)
Catalog(sid: integer, pid: integer, cost: real)
```

The Catalog relation lists the prices charged for parts by Suppliers. Write the following queries in SQL

A. Find the *pname*s of parts for which there is some supplier.
B. Find the *sname*s of suppliers who supply every part.
C. Find the *sname*s of suppliers who supply every red part.
D. Find the *pname*s of parts supplied by Acme Widget Suppliers and by no one else.
E. Find the *sid*s of suppliers who charge more for some part than the average cost of that part (averaged over all the suppliers who supply that part).
F. For each part, find the *sname* of the supplier who charges the most for that part.
G. Find the *sid*s of suppliers who supply only red parts.
H. Find the *sid*s of suppliers who supply a red part and a green part.
I. Find the *sid*s of suppliers who supply a red part or a green part.

-End of Exam-