# UNIVERSITY OF BARISHAL

**DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING**

**FINAL EXAMINATION**

2nd Year 1st Semester; Session: 2019-20

**Course Title: Database Management System**

**Course Code:** CSE-2101

Time: 3 hours | Marks: 60

Instructions:

- ✓ Answer any **FIVE** questions from the followings.
- ✓ All the parts of a question must be answered sequentially.
- ✓ Figures in the right margin indicate full marks.
- ✓ Keep your answer script clean and free from overwriting.

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**1.** a) What is database management system (DBMS)? List and explain four reasons why DBMS is used instead of file processing system. [3]

b) Let R = (M, N, P, S, T). If ***MN*** and ***NS*** can uniquely identify a tuple in the relation r(R) separately, how many super keys, candidate keys and primary keys are there? [3]

c) How many attributes you can use in a table? Is there any limitations? Why you need to split the attributes in multiple tables? [3]

d) Keyword queries in Web Search are quite different from database queries. List key difference between the two, in terms of way the queries are specified, and in terms of what is the result of a query. [3]

**2.** a) What is database trigger? Discuss the strengths and weakness of the trigger mechanism. [3]

b) We can convert any weak entity set to a strong entity set by simply adding appropriate attributes. Then, why do we have weak entity sets? [3]

c) Explain the distinct between database schema and instance. [3]

d) Suppose you want to build a video site similar to YouTube. Consider the disadvantages of keeping data in a file-processing system. Discuss the relevance of each of the disadvantages to the storage of actual video data and to metadata about the video, such as title, the user who uploaded it, tags and which users viewed it. [3]

**3.** a) Suppose somebody want to open an **Online Book Shop.** The book shop need to store different attributes and information of different types of book in its database. Anybody can purchage book by online payment and a customer can also order for some books. The shops can record the detail each of its customer and can suggest according to their purchage interest. [8]

Construct an E-R diagram for that Online Book Shop. Clearly show all the entities, Attributes, Relations, Keys and any other important features of your design.

b) State the % (percentage) and _ (underscore) character in string operations. [2]

c) Give the schema diagram for the following database: [2]

book (ISBN, title, year, price)
author (author-id, name, address, url)
warehouse (code, address, phone)
written-by (written-id, *author-id, ISBN*)
stocks (stock-id, *code, ISBN,* number)

**4.** a) Consider two E-R models **A** and **B**. Model A consists of two entities and one relationship joining them. The entities are ***lecturer*** and ***course*** and the relationship is ***teaches.*** Model B consists of three entities; the first and the third are the same as above but the second entity is called ***lecture.*** The first and second entities are joined by a relationship called ***gives*** while the second and the third entities are joined by a relationship called ***of.*** [4]

Which of the following are correct? Briefly justify your answers.

(i) Both models allow a course to have more than one lecture from the same lecturer.
(ii) Model B is more appropriate if information about all lectures, past and present, is to be stored.
(iii) Model A does not allow lecture date and time to be stored.
(iv) Model B leads to more tables than Model A does when translated to the relational model.

b) Production tracking is important in many manufacturing environments (e.g., the pharmaceuticals industry, children's toys, etc.). The following (**in the Figure 1**) ER diagram captures important information in the tracking of production. Specifically, the ER diagram captures relationships between production lots (or batches), individual production units, and raw materials. [4]

Now, convert the ER diagram into a relational database schema. Be certain to indicate primary keys and referential integrity constraints.

c) Identify some attributes in the ER diagram (**Figure 1**) that might represent composite attribute, and explain why/how it might represent composite attribute. [2]

d) From **Figure 1,** the ER diagram contains several instances of data redundancy. Please identify one instance where a data redundancy issue exists. [2]

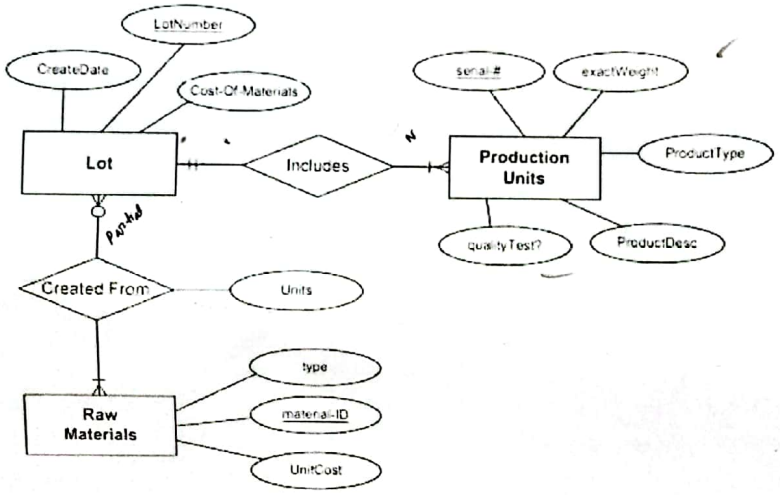


**Figure 1**: ER Diagram of a production tracking system

**5.** a) Consider the database schema below: [8]

*worker (wname, street, city)*
*works (work_id, wname, orgname, salary, jdate)*
*organization (orgname, city)*
*manages (wname, manager-name, shift)*

**Note:** A manager is also an employee of an organization.

Give SQL expressions for the following queries:

(i) Find the names of all employees who work for "Google".
(ii) Find the names of all employees in this database who live in the same city as the company for which they work.
(iii) Find the names of all employees who live in the same city and on the same street as do their managers.
(iv) Give all managers in the database a 7.5% salary raise.
(v) Find the names of the employees living in the same city where Rahim is residing.
(vi) Find the company with the most employees
(vii) Create a view to show all the employees who earn more than average salary.
(viii) Find all the employees who work more than five years for "Facebook".

b) SQL allows a foreign-key dependency to refer to the same relation, as in the following example: [4]

```
CREATE TABLE manager(
    employee-name  CHAR(20),
    manager-name   CHAR(20),
    PRIMARY KEY employee-name,
    FOREIGN KEY (manager-name) REFERENCES manager(employee-name) ON DELETE CASCADE);
```

Here, *employee-name* is a key to the table *manager*, meaning that each employee has at most one manager. The foreign-key clause requires that every manager also be an employee.

(i) Explain exactly what happens when a tuple in the relation *manager* is deleted.

(ii) What will happen, if ***RESTRICT*** is used instead of ***CASCADE***?

6. a) Normalize the following schema with the given constraints up to *3.5NF*. [6]

*books (accessionno, isbn, title, author, publisher)*
*users (userid, name, deptid, deptname)*

*accessionno → isbn*
*isbn → title*
*isbn → publisher*
*isbn → author*
*userid → name*
*userid → deptid*
*deptid → deptname*

b) In the instance of the relation *R(A,B,C,D,E)* shown below, which of the following functional dependencies (**FD's**) hold in the relation **R**? Briefly justify your answer. [3]

(i) AB → C
(ii) B → D
(iii) DE → A

| A | B | C | D | E |
|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 |
| 1 | 4 | 3 | 4 | 5 |
| 1 | 2 | 4 | 4 | 1 |

c) Consider a relation *R(ABCD)* with FDs: {AB→ CD, BC→ D}. Find the minimal cover or irreducible set for the Relation **R**. [3]

7. a) What is database Transaction? Discuss ACID Properties of database transaction. [3]

b) Consider the following two transactions: [3]

| $T_1$ : read(A) | $T_2$ : write(A) |
|---|---|
| read(B) | read(B) |
| B:=A+B | |
| write(B) | |

Add lock and unlock instruction so that the transaction T1 and T2 observe two-phase locking protocol. Is it deadlock free?

c) Check whether the schedule is conflict serializable or not? [3]
S: R1(A); R2(A); R3(B); W1(A); R2(C); R2(B); W2(B); W1(C)

d) Explain the dirty read and lost update problem with example in transaction. [3]

8. a) Differentiate among Primary, secondary and clustering Indexing. [3]

b) When is it preferable to use a dense index rather than a sparse index? Explain your answer. [3]

c) Is it possible in general to have two primary indices on the same relation for different search keys? Explain your answer. [3]

d) Consider a relational database with two relations: [3]

*course (course-name, room, instructor)*
*enrollment (course-name, student-name, grade)*

Define instances of these relations for two courses, each of which enrolls three students. Give the file structure of these relations that uses clustering.

**Good Luck!!!**