BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-2/T-2 B. Sc. Engineering Examinations 2018-19

Sub: **CSE 215** (Database)

Full Marks: 180 Section Marks: 90 Time: 2 Hours (Sections A + B)

USE SEPARATE SCRIPTS FOR EACH SECTION

The figures in the margin indicate full marks.

SECTION – B

There are **TWELVE** questions in this section. Answer any **NINE**.

Figure 1 represents the Relational Schema of the Human Resource (HR) department of an organization. Use this schema for answering the Questions 5-7.

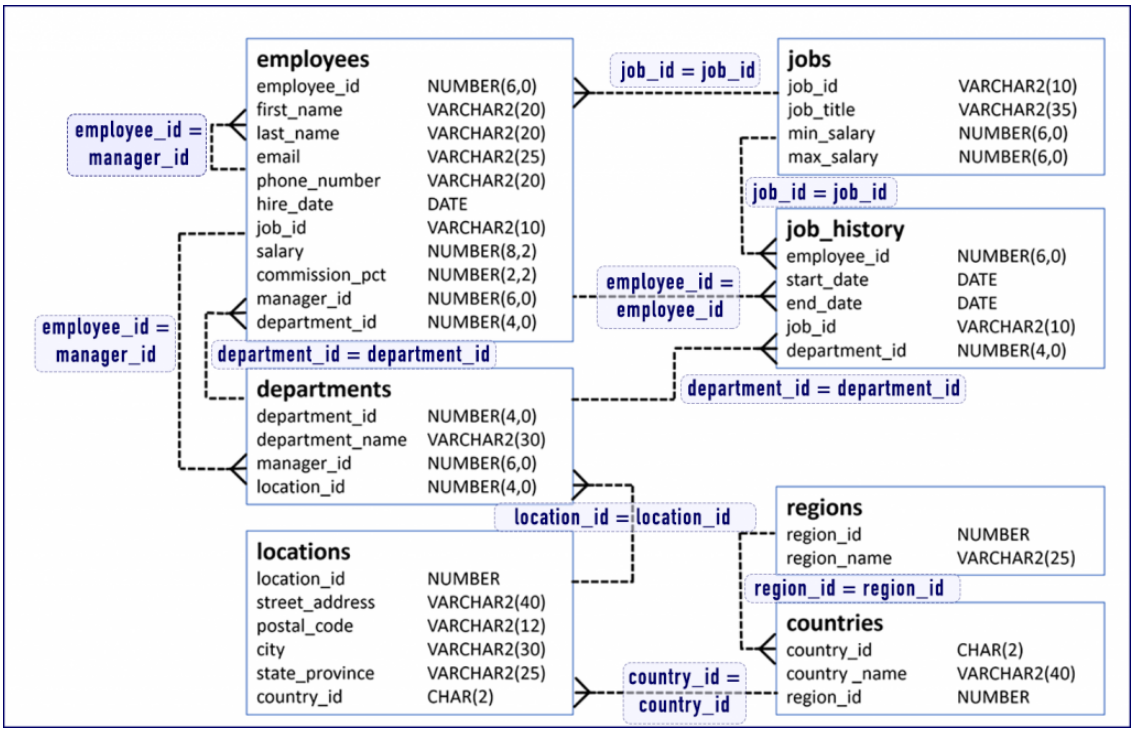

Figure 1: Relational Schema for Q. 5-7

5. Suppose you are intended to show the name (last name only) of each manager along with the number of employees he is managing. You have written the following query which is not giving the correct result. Find out the fault in the query and rewrite it so that it gives your desired result. (10)

```
SELECT E1.LAST_NAME, COUNT(*) AS "TOTAL MANAGED EMPLOYEES"
FROM EMPLOYEE E1 JOIN E2
ON (E1.MANAGER_ID = E2.EMPLOYEE_ID)
GROUP BY E1.MANAGER_ID
ORDER BY "TOTAL MANAGED EMPLOYEES" ASC;
```

6. Write an SQL Query to show the department id, job id, first hiring date, last hiring date and average salary of the employees for each combination of department id and job id, where the average salary is more than 3000. Make sure that any sort of null value is not printed and order the result by department id. (10)

7. Write a procedure named `IncreaseOrDecrease` which takes an employee id as input. If the salary of the employee is greater than the average salaries of all the departments except for his/her own, but less than the average salary of his/her own department, then the procedure will increase his/her salary by 10%. Otherwise, it will decrease his/her salary by 5%. During the execution, as output, it will print "Increasing Salary", or "Decreasing Salary", accordingly. (10)

8. Suppose we are generating a `StaffPropertyInspection` table to include property inspection by staff members. When the staffs are required to undertake the inspections, they are allocated a company car for use on the day of the inspections. However, a car may be allocated to several staff members on the same day at different time slots. A member of staff may inspect several properties on a given date, but a property is only inspected once by a single staff member on a given date. Now normalize the Table `StaffPropertyInspection` of Figure 2 upto 2NF.

   Hint: you have to perform and only show the results of the following steps: (2x5=10)

   i) Find all the candidate keys.
   ii) Determine the primary key.
   iii) Find all the functional dependencies.
   iv) Get the first normal form.
   v) Get the second normal form.

StaffPropertyInspection

propertyNo	iDate	iTime	pAddress	comments	staffNo	sName	carReg
PG4	18-Oct-00	10.00	6 Lawrence St, Glasgow	Need to replace crockery	SG37	Ann Beech	M231 JGR
PG4	22-Apr-01	09.00	6 Lawrence St, Glasgow	In good order	SG14	David Ford	M533 HDR
PG4	1-Oct-01	12.00	6 Lawrence St, Glasgow	Damp rot in bathroom	SG14	David Ford	N721 HFR
PG16	22-Apr-01	13.00	5 Novar Dr, Glasgow	Replace living room carpet	SG14	David Ford	M533 HDR
PG16	24-Oct-01	14.00	5 Novar Dr, Glasgow	Good condition	SG37	Ann Beech	N721 HFR

Figure 2: Table for Q. 8

9. What are the requirements of an ideal DBMS? Define *entity* and *attribute* in the context of database with suitable example(s). (4+6=10)

10. How *redundancy* and *incompleteness* can lead to a bad database design? Explain with appropriate example(s). (10)

11. Differentiate between *strong entity* and *weak entity* by showing appropriate examples. How do you design them in a relational schema? (5+5=10)

12. Production tracking is important in many manufacturing environments (e.g., the pharmaceuticals industry, children's toys, etc.). The ER diagram of Figure 3 captures important information of production tracking. Specifically, the ER diagram captures the relationships among production lots (or batches), individual production units, and raw materials.

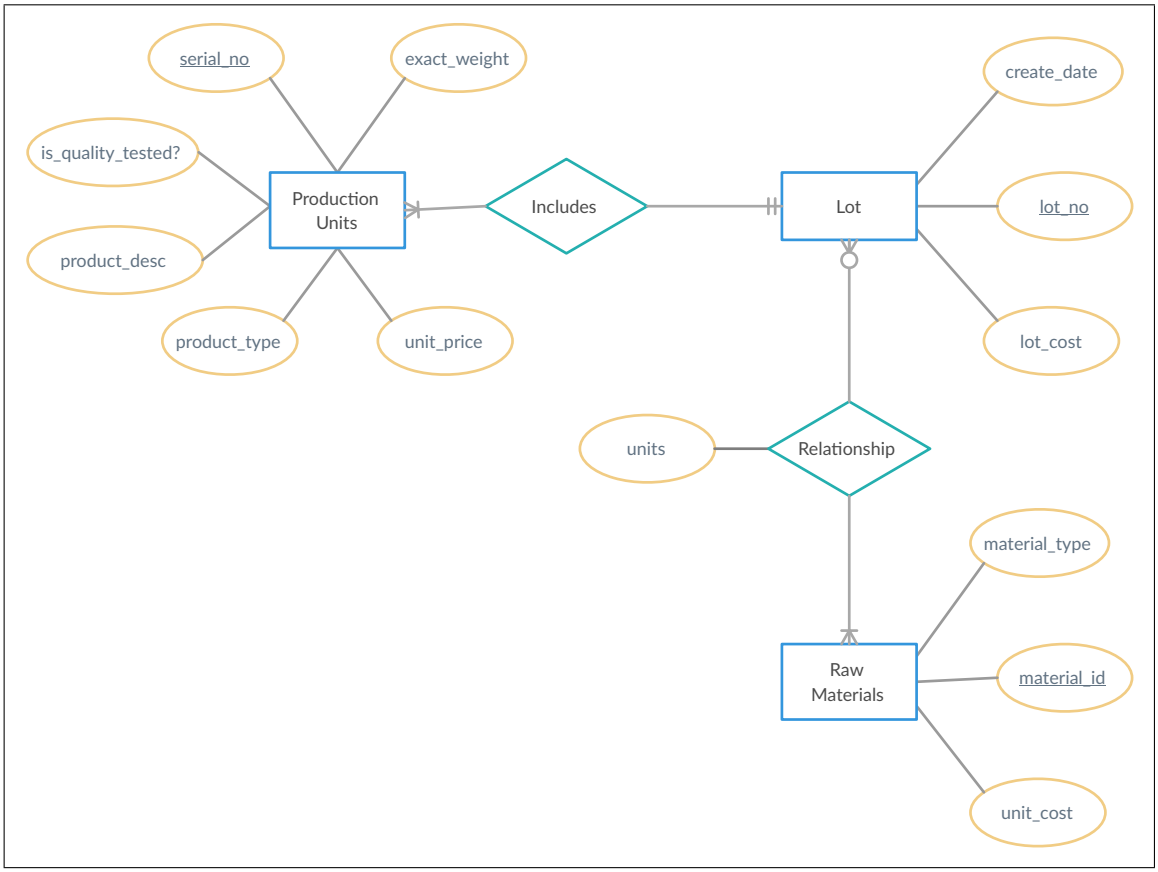

Figure 3: ERD for Q. 12

Now your task is to convert the Entity Relationship Diagram given in Figure 3 into a Relationship Schema. Be certain to indicate primary keys and referential integrity constraints. (10)

13. Suppose you are the manager of the website development department of your organization. Each website developed by your organization can be uniquely identified by a *url*. It also has a public *host-ip* address and a *date* of going live. Each website is developed by a team of developers. Each developer can be uniquely identified by an *employee id*. The relevant information for a developer is his/her *name*, *address*, highest educational *qualification*, *salary* and *hire date*. Each website is developed by a web-based framework which is associated with a particular programming language. Each framework and its associated programming language have a specific *name* and the *development year*. The other information relevant to a web framework is its *author name*.

    Now design a Entity Relationship Diagram for your website development department so that you can manage it conveniently. (10)

14. "A table in `3NF` may fail to meet the criteria of `BCNF`" – do you agree? Show an appropriate example to validate your claim. (10)

15. Consider the following schema of Sonali Bank Limited.

customer (customer_id, customer_name, customer_address)
account (account_id, account_type, account_branch, account_balance)
branch (branch_routing_number, branch_name)
transaction (account_id, transaction_amount, transaction_date)
loan (loan_id, customer_id, loan_amount)

Notice that the attribute *account_branch* of table *account* is a foreign key referencing the primary key *branch_routing_number* from table *branch*. On the other hand, the attribute *account_id* of table *account* is a foreign key referencing the primary key *customer_id* from table *customer*.

Now, write a relational algebra expression using Cartesian product to find out the customers' name and their corresponding loan amounts who have a "savings" type account at the branch named "BUET Br.". (10)

16. Write the equivalent relational algebra expression for the following SQL statement (consider the schema from Q. 15): (10)

```
select c.customer_name, a.account_id, t.transaction_amount
from customer c, account a, transaction t
where c.customer_id = a.account_id and a.account_id = t.account_id
and t.transaction_date = "01-JAN-2020" and t.transaction_amount > 5000
```