Islamic University of Technology

Organisation of Islamic Cooperation (OIC)

Department of Computer Science and Engineering (CSE)

SEMESTER FINAL EXAMINATION **SUMMER SEMESTER, 2018-2019**

Duration: 3 Hours **Full Marks: 100**

CSE 4409: Database Management Systems II

Programmable calculators are not allowed. Do not write anything on the question paper. There are **8 (eight)** questions. *Question no. 7 and 8 are compulsory.* Answer any **4 (four)** from the remaining questions. Figures in the right margin indicate marks.

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1. (a) What are the major purposes of a primary key? What do you mean by cascade in delete of foreign key? Is there any potential problem if this feature is not enabled? Explain. [6]

   (b) Define entity and attribute. Entity and attribute selection must be done carefully. It is important to understand when something has to be selected as entity or attribute. Suppose you are going to design a national database systems. As part of it you design citizen as entity as follows: [10]

   Note: (pk stands for primary key and [fk(x)] refers to foreign key referencing entity x). This notation is applicable to all questions.

   ```
   CITIZENS (id (pk), name, dob, bloodgroup[fk(BLOOD_GROUPS)],
   profession[fk(PROFESSIONS)])
   ```

   Now criticize (with your suggestion) the design specially the selection of both *bloodgroup* and *profession* as foreign key referencing two entities. (Assume, the referenced entities exist).

2. (a) Consider the following 2 entities: [10]

   ```
   DEPT(deptid,name,establishdate)
   EMP(empid (pk),name,hiredate,basicsalary,commission,managerid[fk(EMP)]),
   deptid[fk(DEPT)],location)
   ```

   Now write the SQL statements for the following queries:

   i. Find the list of employees id, name, mananger's name, his salary status. Salary status is determined as follows:

      If salary is above 100000 then it gets the status *high*. If it is between 50000 and 100000 then it is *moderate*, else it is *low*.

   ii. Find the list of department name, establishdate along with its total number of employees.

   iii. Remember the salary in the table indicates basic salary for the employee. Total salary for a particular employee is calculated as follows:

      - House rent is 40% of the basic
      - Transport allowance is 10% of the basic
      - Excellence bonus is 50% of the COMMISSION (if any value exists).

      Total Salary = House rent + Transport allowance + Excellence bonus
      Now write an SQL to find the average salary (here salary means Total Salary) of the top 10 employees (in terms of total salary paid). [Hints: Nesting may be needed to find out this value]

   (b) Consider the EMP of the previous question. Write a function *getstatus* as directed below: [6]

   Input: ID
   Output: status
   Algorithm: If total *yearly salary* is below 500000 then the status is POOR. If it is between

500000 and 800000 then it is ORDINARY, otherwise it is GOOD. (Remember the salary given in table EMP is the salary per month and total salary is calculated as mentioned in the previous problem).

3. (a) What are mapping cardinalities? State two examples of each type of cardinalities. [5]

   (b) Present a comprehensive discussion about the relationship among Tablespaces, Datafiles and Objects. [5]

   (c) Consider a table EMP(ID,Name,DOB,Salary). Now write an SQL to update the salary of the employees by 10% who now receives lower than the existing average salary. [6]

   Write an anonymous block that will execute the above UPDATE statement. If none of the records are affected by the statement then it will print "NO RECORDS ARE UPDATED" , otherwise it will count the total number (x) of updated records and will print the message " A TOTAL OF x RECORDS ARE UPDATED".

4. (a) Read the following requirements: In IUT employees apply for leave at different times. The form each employee fills up contains the following information: [8]

```
Name of employee:----------
Designation:---------------
Leave period: DateFrom---------- DateUpto-------------
Total Working Days Needed:--------
```

   Saturday and Sunday are weekly holidays of IUT. Apart from this there are a number of other holidays (such as 26th March, 16th December and so on). But these days are dynamic and may change from year to year. Employees face serious trouble to count the number of Total Working Days Needed field in the form since it requires examining the calender manually.

   Your task is to facilitate the employees of IUT in this regard. More precisely you are asked to design the required entities (i.e. tables) and to write a function to calculate the total working days given initial date and end date.

   (b) Consider the table *citizens(id, name, dob, salary)*. The Government of Bangladesh (GOB) has created one fund of total BDT *total_aid_amount*. [8]

   GOB wants to ensure (but can not guarantee) each citizen receives an amount *gob_allownace* such that after receiving it his/her total earning *(i.e. salary + gob_allownace)* is equal to the average income of the country (average is computed before any *gob_allownace* is given). The citizens having more than the average salary of the country are not eligible for this scheme.

   For this purpose GOB invites applications from needy and interested people. The applications are stored in *applied(citizen_id),date of application)* table (assume only the valid persons apply).The citizens who have not applied will not be considered even his/her salary is very low.

   The citizen (who applied) with the lowest salary will get the highest priority to receive *gob_allownace* and *gob_allownace* amount is determined by the difference of his/her salary and average salary of the citizen. GOB can not ensure sufficient fund for all needy citizens. So the process terminates whenever the fund is exhausted (i.e. *total_aid_amount*=0 or *total_aid_amount is less than the difference of the average salary and the salary of the particular citizen*).

   When a citizen receives gob_allownace an appropriate update of *citizens* table should be made.

   - Your task is to write a procedure *distribute_allowance* satisfying the above requirements. The procedure will take only one IN parameter i.e. *total_aid_amount*.[Hint: use explicit cursor to select the candidates as per the description]

5. (a) What is %ROWTYPE attribute? State one example to demonstrate its benefit. [4]

(b) ABC bank suddenly discover a mismatch of amount in the system and in hand. After a long investigation it was discovered that the mismatch is the result of a forgery by one of tellers (who delivers and receives money at the counter). You are the DBA of the ABC bank. So, you are going to prevent such events in future. From now on ward, if any update is done in the database by any user then the following records will be stored in a different entity: [6]

`useranme, ipaddress, object Name, name of operation and data time`

Present a solution in this regard.

(c) Consider the following file data stored in a file named input.txt: [6]

```
100#Thomas#Sales#5000
200#Jason#Technology#5500
300#Mayla#Technology#7000
400#Nisha#Marketing#9500
.....
```

Your task is to use SQL Loader to import the data into an appropriate table. Show each step.

6. (a) Define Data Warehouse. What are the major OLAP operations? Explain them. [8]

(b) State the concept of partition in database. It has a number of purposes such performance, manageability and availability. Briefly explain them. [8]

7. (*Compulsory*)

Note: Both question no. 7 and 8 are compulsory. Question no. 8 is based on the design of question no. 7. Hence, it is advised to read both questions first and then answer them.

Consider the following scenario:
The Government of Bangladesh (GOB) decides to design an Integrated Medical Services (IMS) for its citizens. Here key components are Hospitals, Patients and Doctors. The main service is treatment.

- The process starts from hospitals. Each hospital is exactly owned by one person. Multiple partnership and multiple ownership are not allowed. Hospital information includes its ID, Full Name,Establishdate, Size (either Large,Medium or Small) and location. As owner the system stores person's ID,Name,DOB and Contact No.
- Doctors with their ID,name and specialization are assigned to hospitals. One doctor may be assigned to more than one hospitals, similarly one hospital may assign multiple doctors. A doctor is assigned to a hospital along with room no. of that particular hospital and visiting hour.
- Patients (with ID, Name, DOB and Gender) arrive at a specific hospital and are admitted to it along with a suitable doctor (from its registered doctors list). It maintains information such as Date of Admission, Date of Release and Room/Cabin No. It also stores patients feedback which is either Excellent (4), Good (3), Average (2) or Poor (1). The system will use only the numeric values (given in bracket) to encode these status values. Every patient must provide feedback before he leaves the hospital.

(a) To implement the above system, draw the ERD first. [10]

(b) Write the DDLs to implement the ERD. [10]

8. (*Compulsory*)

This question is based on Question no.7.

(a) Write a function in PL/SQL to generate hospital ID. Format of ID is $XYYYYMM.NNN$ where X is the size bit (i.e. S for Small, M for Medium and L for Large), YYYYMM is the year and month no. of establishment date and NNN is the incremental numeric value starting from 100 (i.e. next value will be 101 if size and establishment date are same). Finally write a trigger to this function so that ID generation is truly automatic. [8]

(b) One of the objectives of IMS is to assess and identify good doctors based on the feedback from the patients. Write a function to assess the status of doctors. The status is binary: *excellent* or *ordinary*. To get *excellent* status all of the following conditions should be met otherwise the status is *ordinary*: [8]

- A doctor must have an average rating or feedback of 3 or more.
- He must work at least in 2 hospitals out of which 1 must be of Large size.
- He can not work more than 3 hospitals in any case, if so he is no longer considered for *excellent* status even if all other criteria are met.