DUBLIN INSTITUTE OF TECHNOLOGY

BSc. (Honours) Degree in Computer Science

Year 3

WINTER EXAMINATIONS 2014/2015

DATABASES 2 [CMPU3010]

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TUESDAY 16TH DECEMBER   1.00 P.M. – 3.00 P.M.

TWO HOURS

READ THE CASE STUDY ON PAGE 2 BEFORE ATTEMPTING QUESTION 1.

ANSWER QUESTION 1 (40%) AND TWO OTHERS (30% EACH).

Project monitoring

A university runs a computing course that includes a period of industrial placement when students work for an external company on an approved project. The project tutor writes to companies to ask for projects. Companies reply with an outline specification of a project, listing key skills they believe are required for this project. The projects tutor liaises with the company as necessary to obtain detail on the project and makes a decision on whether to approve it or not. He / she records approved projects. Initially, new projects have nulls in the studentid, supervisor and second reader attributes. The tutor associates the skills required with skills the students have studied. A Company may forward many projects. The list of approved projects is made available to the students and each student may select up to three projects. The project tutor then assigns projects to students, trying as far as possible to satisfy choices made. Student skills are evaluated by the examinations office, based on the modules the student has taken and passed. The examinations officer enters skills held for each student.

When students have been allocated to projects, the tutor assigns a supervisor (the project supervisor column is updated with the supervisor's staffno) and a second reader (the project second reader column is updated with the second reader's staffno). The project tutor then writes to the companies to inform them whether or not their project has bee selected and if so, of the allocations (student and supervisors) made. The skills held by the allocated student are listed. The first supervisor must make an initial visit to the company with the student to set project objectives and also must make a mid-project and end-of-project visit. After each visit, the supervisor submits a progress report. At the end of the project period both supervisors must together assess the work carried out based on a report submitted by the student. The project tutor monitors project progress throughout.
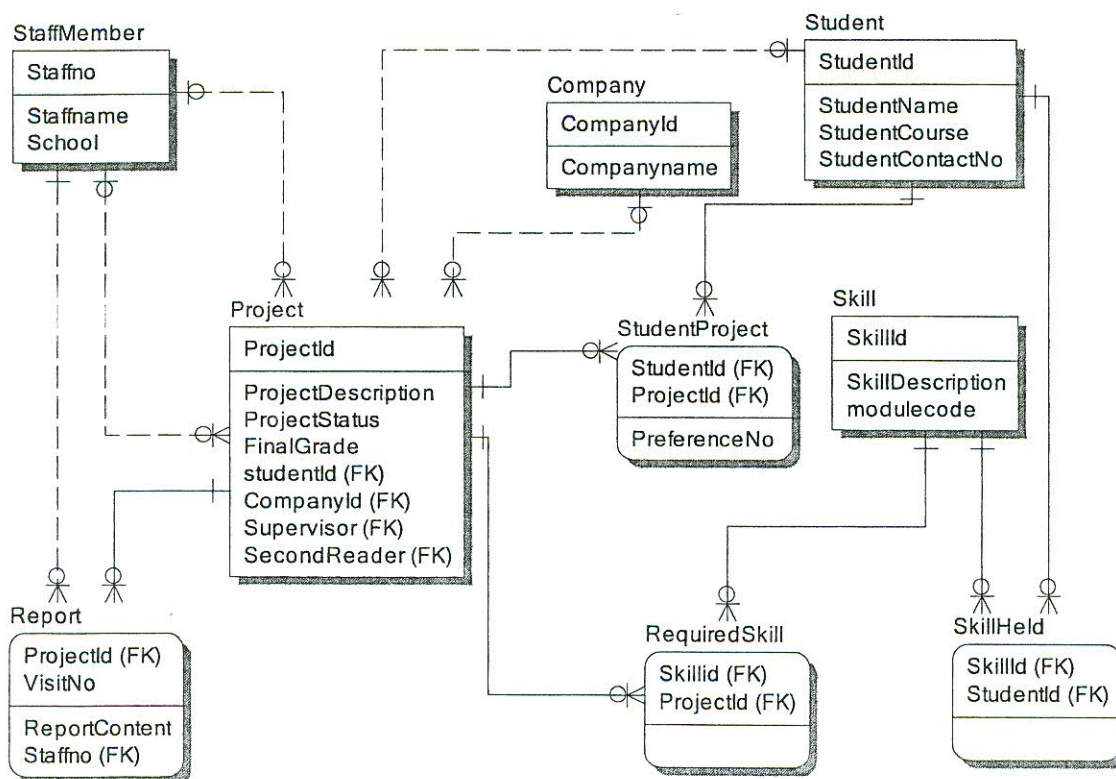

Figure 1 Entity Relationship Diagram – Project Monitoring System

1. The diagram in Figure 1 shows the conceptual schema for the Project Monitoring system. The system involves different types of user.

(i) A **project tutor** coordinates the companies and project ideas, allocating skills required to each. When student preferences have been entered, the project tutor assigns projects to students, by updating the Project, putting the student id in against the project allocated to that student. The project tutor allocates a supervisor and second supervisor to the project. The project tutor can read all project reports throughout the lifetime of the project.

(ii) A student can look up the list of projects that are posted, the companies that suggested them and the skills required for those projects. The student can pick up to three projects and give them a ranking of 1, 2 or 3. When projects have been assigned, the student can see which project and which supervisors have been assigned. The student cannot see the supervisors' reports after company visits. When the final grade is posted, the student can see that.

(iii) The supervisor can see all details of projects, students and skills and any reports for projects he / she is supervising. The supervisor writes reports after visiting companies and is in charge of maintaining the final grade and the status of the project.

(iv) The examinations officer adds students who have progressed to the project stage and enters each student's skills. If a new skill becomes available, the examinations officer adds this.

(a) List the tables and columns to which each user role should have access and the type of access the role should have (create, insert, update, delete). (8 marks)

(b) (i) Write a SQL query to list the project description, skill description and module code for any projects that require any skill with the string 'Database' in its description. (5 marks)

(ii) Write a SQL query to list the project id, project description, student name, company name and description of skills required for each project that has not been allocated a supervisor. (5 marks)

(iii) Write a SQL query to list any skilldescription and module code that is not recorded as required for any project. (5 marks)

(c) Students are only allowed to list three preferences for projects. Write code that you think you would need to ensure that a student cannot choose more than three projects. (7 marks)

Justify your choice and state any other method you may have used. (3 marks)

(d) The schema owner is considering putting indexes on the Project table. Suggest the possible indexes that could be put on the table, giving advantages and disadvantages. (7 marks)

Course: DT258   Stage: 3   Year: 2013

Student Id	Name		Pref No.	Project Id	Project Title	Company Id	Company Name
C98003301	Allen	Audrey	1	A	Virtualizing Data Centres	SUNMC	SunMS
C98003301	Allen	Audrey	2	F	Migrating to the Cloud	UNICO	UniCorp
C98003301	Allen	Audrey	3	D	Automating exam correction	SISCO	Sisco
C98003303	Bourke	Padraic	1	B	Stock Tracking And Analysis	SEQLL	Sequell
C98003303	Bourke	Padraic	2	E	Smart Card Application	DALEX	Data Lexicon
C98003303	Bourke	Padraic	3	C	In-memory databases	MSOFT	Microsoft
C98003302	Bradley	Brian	1	G	Frequent Flyer App	DALEX	Data Lexicon
C98003302	Bradley	Brian	2	H	Research Into Client/Server	SISCO	Sisco
C98003302	Bradley	Brian	3	D	Automating exam correction	SISCO	Sisco
C98003341	Butler	Roslyn	1	C	In-memory databases	MSOFT	Microsoft
C98003341	Butler	Roslyn	2	B	Stock Tracking And Analysis	SEQLL	Sequell
C98003341	Butler	Roslyn	3	D	Automating exam correction	SISCO	Sisco
C98003394	Byrne	Hazel	1	D	Automating exam correction	SISCO	Sisco
C98003394	Byrne	Hazel	2	C	In-memory databases	MSOFT	Microsoft
C98003394	Byrne	Hazel	3	F	Migrating to the Cloud	UNICO	UniCorp
C98003344	Collier	Shay	1	E	Smart Card Application	DALEX	Data Lexicon
C98003344	Collier	Shay	2	A	Virtualizing Data Centres	SUNMC	SunMS
C98003344	Collier	Shay	3	F	Migrating to the Cloud	UNICO	UniCorp

Figure 2 Student Project Preference Sheet.

2. Each year, project coordinators for the different programmes and stages draw up a sheet of student preferences (Figure 2). Each student can choose up to three projects, numbering them 1, 2 and 3. Each project is connected to a company.

    (a) Represent the preference sheet in unnormalised form, first normal form, second normal form and third normal form.   (4x5 marks)

    (b) Many third level institutions around the world make project reports available to other institutions. One of the advantages of this is that students can search the body of work for keywords, and retrieve reports that might help them in their own project. Give a description of how you think this data should be held and searched.   (10 marks)

3.   (i)   Write a SQL query that lists the name and school of each staff member, followed by the number of projects they are supervising (include staff members who are not supervising any projects).   (10 marks)

(ii)   Write a SQL query to list any skill description and module code that are required for all projects.   (10 marks)

(iii)   Write a SQL query that will list every possible combination of supervisor and second reader from the staffmembers table, knowing that the combination of John', 'Frank' as supervisor and second reader is different to combination of 'Frank', 'John' as supervisor and second reader, but no staff member can be both supervisor and second reader for the same project.   (10 marks)

4.   Write an anonymous block that will accept a staff no and a project id and allocate the staff member as a supervisor for that project. Reject the transaction if the staff member or project does not exist, or if the staff member is already a second reader of the project, or if the project already has a supervisor.   (30 marks)

SELECT column-list FROM tablename
[WHERE condition]
[ORDER BY column-list]
[GROUP BY column-name]
[HAVING condition]
SELECT column-list FROM join-expression
Join-expression =
   table1 JOIN table2 ON condition | USING (column-list)
   table1 LEFT JOIN table2 ON condition | USING
      (column-list)
Conditions : =,>,<,>=,<=,<>, BETWEEN .. AND.., IN (list),
      IS NULL, LIKE

Logical operators: AND, OR, NOT
Set operations: UNION, INTERSECT, MINUS

CREATE TABLE tablename
({column-definition}
[PRIMARY KEY ({column-name},)]
{[FOREIGN KEY ({column-name}) REFERENCES
      tablename]})

INSERT INTO tablename [{column-name,}] VALUES (data-
      value-list)

UPDATE tablename
[SET column-name= <data-value>] [WHERE condition]

Column-definition = column-name [CHAR [(n)] |
      VARCHAR(n) | NUMBER [n,p] | DATE |

DATETIME] {[NOT NULL | UNIQUE |
      PRIMARY KEY]}

Create or replace trigger <trigger-name>
Before | after
{delete|insert|update [of column[,column]...]}
ON table-name
[referencing {old [as] <old> [new [as] <new>]
For each row
[when (condition)]]
Pl/sql_block

Procedure
CREATE [OR REPLACE] PROCEDURE procedurename
      [parameter1, parameter2...] IS
[constant/variable declarations]
BEGIN
   Executable statements
RETURN Returnvalue
[EXCEPTION
   exception handlers
END [procedurename]