# Practical 3 – Normalization

**Objectives of this practical**

- Normalize database tables to 1NF, 2NF and 3NF

# Contents

**Normalization**

## Question 1

You are given the following student_course_module table containing data as shown:

| adm_no | stud_name | crse_cd | crse_name | mod_cd | mod_name | mark |
|---|---|---|---|---|---|---|
| A001 | Janice | DIT | Diploma in Information Technology | SC | Secure Coding | 83 |
| | | | | DBS | Database Systems | 72 |
| | | | | FOC | Fundamentals of Computing | 78 |
| | | | | BED | Back-end Development | 87 |
| A002 | Anita | DAAA | Diploma in AI and Analytics | DL | Deep Learning | 87 |
| | | | | DENG | Data Engineering | 83 |
| | | | | FOC | Fundamentals of Computing | 78 |
| | | | | BED | Back-end Development | 87 |
| … | … | … | … | … | … | … |

(a) Is the student_course_module table in 0NF? Justify your answer.

(b) Write the table in the relational heading format.

(c) What is a first normal form (1NF) table? Transform the table, if it is not already in the 1NF, into the first normal form. Present your 1NF table in
   (i) a table form as shown above
   (ii) relational heading format

(d) Using the 1NF table student_course_module, explain, what is insert, update and delete anomaly.

(e) Transform the 1NF relation of student_course_module into a set of 2NF relations.

(f) What is a 2NF table?

(g) Transform the set of 2NF relations of into a set of 3NF relations.

## Question 2

The following table stores the project charges of a software house:

project_charges

| p_no | p_name | e_no | e_name | job_type | man_day_ rate | man_day_ billed | total_ charge |
|---|---|---|---|---|---|---|---|
| 102 | VesselSoft | 565 | Tan | PM | 1000 | 5 | 5,000 |
| | | 798 | Lim | PL | 800 | 20 | 16,000 |
| | | 885 | Gay | SE | 400 | 50 | 20,000 |
| 201 | Soft Machine | 565 | Tan | PM | 1000 | 4 | 4,000 |
| | | 698 | Lin | PL | 800 | 10 | 8,000 |
| | | 888 | Sia | SE | 400 | 100 | 40,000 |
| | | 555 | Chan | Prog | 200 | 100 | 20,000 |

Legend

| | |
|---|---|
| p_no | Project Number which uniquely identifies a project |
| p_name | Project Name |
| e_no | Employee Number which uniquely identifies an employee |
| e_name | Employee Name |
| Job_type | Job designation held by an employee |
| man_day_rate | Rate charged per day for a specific job type |
| man_day_billed | Number of days to be billed for an employee working in a project |
| total_charge | Total amount charged for an employee in a project |

- Each employee can only hold one job_type.
- The man_day_rate is dependent on the job_type
- The number of days an employee worked on a project is recorded in the man_day_billed column.

(a) The following is an *incorrect* first normal form (1NF) for the above project_charges table:

project_charges (**p_no**, p_name, {**e_no, e_name**, job_type, man_day_rate, man_day_billed, total_charges})

Primary key is given as:

p_no, e_no, e_name

Explain the error(s) in the given 1NF table, and write the corrected 1NF table.

(b) Derive the second normal form relation(s) from the corrected first normal form relation.

(c) State if the following statement is True or False:

Deletion anomalies cannot exist in second normal form tables.

(d) Derive the third normal form relations from the second normal form relations in (c).