Imperial College Business School

MSc Business Analytics Online Examinations 2018/2019

For internal Students of Imperial College of Science Technology and Medicine.
This paper also forms part of the examination for the Associateship.

FUNDAMENTALS OF DATABASE TECHNOLOGIES (BS2304)

MOCK EXAM

CLOSED BOOK

Instructions

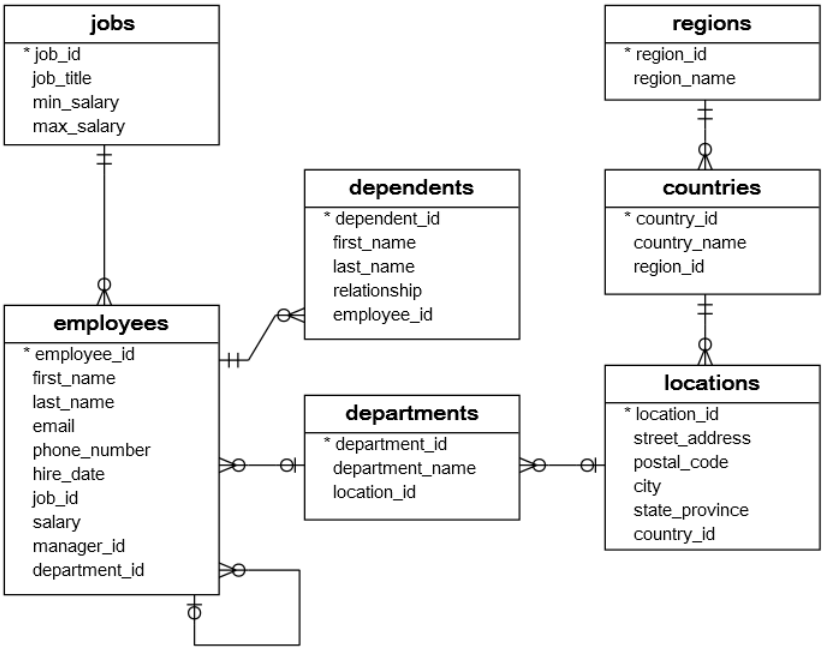
Answer **ALL** questions from both Part A and Part B.

Assume you are using the Postgres dialect of SQL.

College approved calculators may be used.

The supplied SQL information sheet may be used.

The following ER diagram is referred to in Parts A and B.



Part A: Theory

Question 1
5 marks

Summarise the relational database paradigm, illustrating its benefits for businesses and data scientists.

Question 2
3 marks

Explain the constraints placed on a database design by second normal form (2NF).

Question 3
3 marks

Explain the constraints placed on a database design by third normal form (3NF).

Subsequent questions refer to the database schema provided above.

Question 4
8 marks

a) What is the difference between a one-to-one relationship and a one-to-many relationship?

b) Is the relationship between jobs and employees a one-to-one relationship or a one-to-many relationship? Explain how you know this.

c) What specific construct is required to implement a many-to-many relationship in an SQL database?

d) Are there any many-to-many relationships in the database schema provided? Justify your answer.

Part B: Queries

Question 1
2 marks

Write an SQL query to return all data from the employees table.

Question 2
2 marks

Write an SQL query to return each employee's full name and their job title.

Question 3
3 marks

Write an SQL query to show the id of each department, and the average salary of employees in that department.

Question 4
3 marks

Write an SQL query to show the id of each country, and the number of employees present in that country.

Question 5
4 marks

Write an SQL query to show the first and last name of each employee, along with their department ID and the average salary of employees in that department.

Question 6
8 marks

Consider the following SQL query.

```
SELECT department_name, COUNT(employee_id)
FROM employees INNER JOIN departments
ON employees.department_id = departments.department_id
GROUP BY department_name
```

a)

i) What problem could occur if two separate departments happen to have the same name?

ii) Write a new SQL query which fixes this problem, and explain why your query is better.

b)

i) Consider the following SQL query.

```
SELECT employees.department_id, COUNT(employee_id)
FROM employees INNER JOIN departments
ON employees.department_id = departments.department_id
GROUP BY (departments.department_id)
```

Will this query run, or give an error? Explain why.

ii) Consider the following SQL query.

```
SELECT departments.department_id, departments.department_name,
COUNT(employee_id)
FROM employees INNER JOIN departments
ON employees.department_id = departments.department_id
GROUP BY (departments.department_id)
```

Will this query run, or give an error? Explain why.