

## A. Creation of tables, defining constraints, and demonstrating SQL objects such as views, indexes, sequences, and synonyms.

```
Select Command Prompt - mysql -u root -p
mysql> create database A2;
Query OK, 1 row affected (0.10 sec)

mysql> use A2;
Database changed
mysql>
mysql> -- 1. Department Table
mysql> create table dept(
    ->     dept_id int primary key,
    ->     dept_name varchar(50) unique not null
    -> );
Query OK, 0 rows affected (0.14 sec)

mysql>
mysql> desc dept;
+-----+-----+-----+-----+
| Field | Type   | Null | Key | Default | Extra |
+-----+-----+-----+-----+
| dept_id | int    | NO   | PRI | NULL    |       |
| dept_name | varchar(50) | NO  | UNI | NULL    |       |
+-----+-----+-----+-----+
2 rows in set (0.04 sec)

mysql> select * from dept;
Empty set (0.01 sec)

mysql>
mysql> -- 2. Instructor Table
mysql> create table instructor(
    ->     instr_id int primary key,
    ->     instr_name varchar(100) not null,
    ->     salary decimal(10,2) check(salary >= 0),
    ->     dept_id int,
    ->     constraint fk_instr foreign key(dept_id) references dept(dept_id)
    -> );
Query OK, 0 rows affected (0.07 sec)

mysql>
mysql> desc instructor;
+-----+-----+-----+-----+
| Field | Type   | Null | Key | Default | Extra |
+-----+-----+-----+-----+
| instr_id | int    | NO   | PRI | NULL    |       |
| instr_name | varchar(100) | NO  |     | NULL    |       |
| salary | decimal(10,2) | YES  |     | NULL    |       |
| dept_id | int    | YES  | MUL | NULL    |       |
+-----+-----+-----+-----+
4 rows in set (0.00 sec)

mysql> select * from instructor;

mysql> select * from instructor;
Empty set (0.00 sec)

mysql>
mysql> -- 3. Student Table
mysql> create table student(
    ->     stud_id int primary key,
    ->     stud_name varchar(100),
    ->     dept_id int,
    ->     constraint fk_stud foreign key(dept_id) references dept(dept_id)
    -> );
Query OK, 0 rows affected (0.06 sec)

mysql>
mysql> desc student;
+-----+-----+-----+-----+
| Field | Type   | Null | Key | Default | Extra |
+-----+-----+-----+-----+
| stud_id | int    | NO   | PRI | NULL    |       |
| stud_name | varchar(100) | YES  |     | NULL    |       |
| dept_id | int    | YES  | MUL | NULL    |       |
+-----+-----+-----+-----+
3 rows in set (0.00 sec)
```

```
mysql> -- 4. Course Table
mysql> create table course(
    ->     course_id varchar(20) primary key,
    ->     title varchar(100),
    ->     credits int check(credits > 0),
    ->     dept_id int,
    ->     constraint fk_course foreign key(dept_id) references dept(dept_id)
    -> );
Query OK, 0 rows affected (0.10 sec)

mysql>
mysql> desc course;
+-----+-----+-----+-----+
| Field | Type   | Null | Key | Default | Extra |
+-----+-----+-----+-----+
| course_id | varchar(20) | NO  | PRI | NULL    |       |
| title      | varchar(100)  | YES |     | NULL    |       |
| credits    | int        | YES |     | NULL    |       |
| dept_id    | int        | YES | MUL | NULL    |       |
+-----+-----+-----+-----+
4 rows in set (0.00 sec)

mysql> select * from course;
Empty set (0.00 sec)

mysql>
mysql> -- 5. Company Table
mysql> create table company(
    ->     comp_id int primary key,
    ->     comp_name varchar(100) unique,
    ->     city varchar(100)
    -> );
Query OK, 0 rows affected (0.07 sec)

mysql>
mysql> desc company;
+-----+-----+-----+-----+
| Field | Type   | Null | Key | Default | Extra |
+-----+-----+-----+-----+
| comp_id | int    | NO  | PRI | NULL    |       |
| comp_name | varchar(100) | YES | UNI | NULL    |       |
| city     | varchar(100) | YES |     | NULL    |       |
+-----+-----+-----+-----+
3 rows in set (0.00 sec)
```

```
mysql> -- 6. Employee Table
mysql> create table employee(
    ->     emp_id int primary key,
    ->     emp_name varchar(100),
    ->     salary decimal(10,2)
    -> );
Query OK, 0 rows affected (0.03 sec)

mysql>
mysql> desc employee;
+-----+-----+-----+-----+
| Field | Type   | Null | Key | Default | Extra |
+-----+-----+-----+-----+
| emp_id | int    | NO  | PRI | NULL    |       |
| emp_name | varchar(100) | YES |     | NULL    |       |
| salary   | decimal(10,2) | YES |     | NULL    |       |
+-----+-----+-----+-----+
3 rows in set (0.01 sec)

mysql> select * from employee;
Empty set (0.00 sec)

mysql>
mysql> -- 7. Employee-Company Table
mysql> create table emp_comp(
    ->     emp_id int,
    ->     comp_id int,
    ->     primary key(emp_id, comp_id),
    ->     foreign key(emp_id) references employee(emp_id),
    ->     foreign key(comp_id) references company(comp_id)
    -> );
Query OK, 0 rows affected (0.09 sec)

mysql>
mysql> desc emp_comp;
+-----+-----+-----+-----+
| Field | Type | Null | Key | Default | Extra |
+-----+-----+-----+-----+
| emp_id | int  | NO  | PRI | NULL    |       |
| comp_id | int  | NO  | PRI | NULL    |       |
+-----+-----+-----+-----+
2 rows in set (0.01 sec)
```

```
mysql> -- 8. View
mysql> create view instr_dept_view as
-> select i.instr_id, i.instr_name, d.dept_name, i.salary
-> from instructor i join dept d on i.dept_id = d.dept_id;
Query OK, 0 rows affected (0.01 sec)
```

```
mysql>
mysql> desc instr_dept_view;
+-----+-----+-----+-----+
| Field | Type   | Null | Key | Default | Extra |
+-----+-----+-----+-----+
| instr_id | int    | NO   |     | NULL    |       |
| instr_name | varchar(100) | NO   |     | NULL    |       |
| dept_name | varchar(50)  | NO   |     | NULL    |       |
| salary    | decimal(10,2) | YES  |     | NULL    |       |
+-----+-----+-----+-----+
4 rows in set (0.00 sec)
```

```
mysql> select * from instr_dept_view;
Empty set (0.00 sec)
```

```
mysql>
mysql> -- 9. Index
mysql> create index idx_instr_salary on instructor(salary);
Query OK, 0 rows affected (0.03 sec)
Records: 0  Duplicates: 0  Warnings: 0
```

```
mysql> -- Insert Data
mysql> insert into dept (dept_id, dept_name) values
-> (1,'Computer Science'),
-> (2,'Information Technology'),
-> (3,'Mechanical');
Query OK, 3 rows affected (0.01 sec)
Records: 3  Duplicates: 0  Warnings: 0
```

```
mysql>
mysql> insert into instructor (instr_id, instr_name, salary, dept_id) values
-> (1,'Ramesh',80000,1),
-> (2,'Suresh',75000,2),
-> (3,'Anil',90000,1),
-> (4,'Sunita',70000,3);
Query OK, 4 rows affected (0.01 sec)
Records: 4  Duplicates: 0  Warnings: 0
```

```
mysql>
mysql> insert into student (stud_id, stud_name, dept_id) values
-> (1,'Rahul',1),
-> (2,'Neha',2),
-> (3,'Amit',3);
Query OK, 3 rows affected (0.00 sec)
Records: 3  Duplicates: 0  Warnings: 0
```

```
mysql>
mysql> insert into course (course_id, title, credits, dept_id) values
-> ('CS101','DBMS',3,1),
-> ('CS102','Operating Systems',4,1),
-> ('IT101','Networking',3,2),
-> ('ME101','Thermodynamics',3,3);
Query OK, 4 rows affected (0.00 sec)
Records: 4  Duplicates: 0  Warnings: 0
```

```
mysql>
mysql> insert into company (comp_id, comp_name, city) values
-> (1,'TCS','Mumbai'),
-> (2,'Infosys','Pune'),
-> (3,'Wipro','Bangalore');
Query OK, 3 rows affected (0.01 sec)
Records: 3  Duplicates: 0  Warnings: 0
```

```
mysql> insert into employee (emp_id, emp_name, salary) values
-> (1,'Rajesh',50000),
-> (2,'Deepak',45000),
-> (3,'Kavita',60000);
Query OK, 3 rows affected (0.01 sec)
Records: 3  Duplicates: 0  Warnings: 0
```

```
mysql>
mysql> insert into emp_comp (emp_id, comp_id) values
-> (1,1),
-> (2,1),
-> (3,2);
Query OK, 3 rows affected (0.00 sec)
Records: 3  Duplicates: 0  Warnings: 0
```

```

mysql> -- Final check
mysql> select * from dept;
+-----+-----+
| dept_id | dept_name |
+-----+-----+
| 1 | Computer Science
| 2 | Information Technology
| 3 | Mechanical
+-----+
3 rows in set (0.00 sec)

mysql> select * from instructor;
+-----+-----+-----+-----+
| instr_id | instr_name | salary | dept_id |
+-----+-----+-----+-----+
| 1 | Ramesh | 80000.00 | 1 |
| 2 | Suresh | 75000.00 | 2 |
| 3 | Anil | 90000.00 | 1 |
| 4 | Sunita | 70000.00 | 3 |
+-----+-----+-----+-----+
4 rows in set (0.00 sec)

mysql> select * from student;
+-----+-----+-----+
| stud_id | stud_name | dept_id |
+-----+-----+-----+
| 1 | Rahul | 1 |
| 2 | Neha | 2 |
| 3 | Amit | 3 |
+-----+-----+-----+
3 rows in set (0.00 sec)

mysql> select * from course;
+-----+-----+-----+-----+
| course_id | title | credits | dept_id |
+-----+-----+-----+-----+
| CS101 | DBMS | 3 | 1 |
| CS102 | Operating Systems | 4 | 1 |
| IT101 | Networking | 3 | 2 |
| ME101 | Thermodynamics | 3 | 3 |
+-----+-----+-----+-----+
4 rows in set (0.00 sec)

```

```

mysql> select * from company;
+-----+-----+-----+
| comp_id | comp_name | city |
+-----+-----+-----+
| 1 | TCS | Mumbai |
| 2 | Infosys | Pune |
| 3 | Wipro | Bangalore |
+-----+-----+-----+
3 rows in set (0.00 sec)

mysql> select * from employee;
+-----+-----+-----+
| emp_id | emp_name | salary |
+-----+-----+-----+
| 1 | Rajesh | 50000.00 |
| 2 | Deepak | 45000.00 |
| 3 | Kavita | 60000.00 |
+-----+-----+-----+
3 rows in set (0.00 sec)

mysql> select * from emp_comp;
+-----+-----+
| emp_id | comp_id |
+-----+-----+
| 1 | 1 |
| 2 | 1 |
| 3 | 2 |
+-----+-----+
3 rows in set (0.00 sec)

mysql> select * from instr_dept_view;
+-----+-----+-----+-----+
| instr_id | instr_name | dept_name | salary |
+-----+-----+-----+-----+
| 1 | Ramesh | Computer Science | 80000.00 |
| 3 | Anil | Computer Science | 90000.00 |
| 2 | Suresh | Information Technology | 75000.00 |
| 4 | Sunita | Mechanical | 70000.00 |
+-----+-----+-----+-----+
4 rows in set (0.00 sec)

```

**B. Data manipulation: inserting, selecting, updating, deleting, using functions, operators, joins, aggregates, and set operations.**

```
mysql> use A2;
Database changed
mysql> -- 1. List all students
mysql> select * from student;
+-----+-----+
| stud_id | stud_name | dept_id |
+-----+-----+
| 1 | Rahul | 1 |
| 2 | Neha | 2 |
| 3 | Amit | 3 |
+-----+-----+
3 rows in set (0.09 sec)

mysql>
mysql> -- 2. Titles of courses in 'Computer Science' with 3 credits
mysql> select title from course c join dept d on c.dept_id=d.dept_id
-> where d.dept_name='Computer Science' and c.credits=3;
+-----+
| title |
+-----+
| DBMS |
+-----+
1 row in set (0.01 sec)

mysql>
mysql> -- 3. Names of instructors in 'Information Technology' earning > 70000
mysql> select instr_name from instructor i join dept d on i.dept_id=d.dept_id
-> where d.dept_name='Information Technology' and i.salary>70000;
+-----+
| instr_name |
+-----+
| Suresh |
+-----+
1 row in set (0.00 sec)

mysql>
mysql> -- 4. IDs & titles of courses taught by 'Ramesh'
mysql> select distinct c.course_id, c.title
-> from course c join dept d on c.dept_id=d.dept_id
-> join instructor i on i.dept_id=d.dept_id
-> where i.instr_name='Ramesh';
+-----+-----+
| course_id | title |
+-----+-----+
| CS101 | DBMS |
| CS102 | Operating Systems |
+-----+-----+
2 rows in set (0.01 sec)

mysql> -- 5. Course IDs starting with 'CS'
mysql> select course_id from course where course_id like 'CS%';
+-----+
| course_id |
+-----+
| CS101 |
| CS102 |
+-----+
2 rows in set (0.01 sec)

mysql>
mysql> -- 6. Course titles containing 'DBMS'
mysql> select title from course where title like '%DBMS%';
+-----+
| title |
+-----+
| DBMS |
+-----+
1 row in set (0.00 sec)
```

```
Select Command Prompt - mysql -u root -p

mysql>
mysql> -- 7. Highest and lowest salary of instructors
mysql> select max(salary) as highest, min(salary) as lowest from instructor;
+-----+-----+
| highest | lowest   |
+-----+-----+
| 90000.00 | 70000.00 |
+-----+-----+
1 row in set (0.01 sec)

mysql>
mysql> -- 8. Maximum salary per department
mysql> select d.dept_name, max(i.salary) as max_salary
      -> from instructor i join dept d on i.dept_id=d.dept_id
      -> group by d.dept_name;
+-----+-----+
| dept_name        | max_salary |
+-----+-----+
| Computer Science | 90000.00 |
| Information Technology | 75000.00 |
| Mechanical       | 70000.00 |
+-----+-----+
3 rows in set (0.00 sec)

mysql>
mysql> -- 9. Increase salary by 10% for 'Computer Science' instructors earning < 85000
mysql> update instructor set salary=salary*1.1
      -> where dept_id=(select dept_id from dept where dept_name='Computer Science')
      -> and salary < 85000;
Query OK, 1 row affected (0.01 sec)
Rows matched: 1  Changed: 1  Warnings: 0

mysql>
mysql> -- 10. Delete courses with credits < 3
mysql> delete from course where credits<3;
Query OK, 0 rows affected (0.00 sec)

mysql>
mysql> -- 11. Count of employees working at 'TCS'
mysql> select count(*) as emp_count
      -> from emp_comp ec join company c on ec.comp_id=c.comp_id
      -> where c.comp_name='TCS';
+-----+
| emp_count |
+-----+
|      2    |
+-----+
1 row in set (0.00 sec)

mysql> ■
mysql> -- 12. Number of employees in each company
mysql> select c.comp_name, count(ec.emp_id) as emp_count
      -> from company c left join emp_comp ec on c.comp_id=ec.comp_id
      -> group by c.comp_name;
+-----+-----+
| comp_name | emp_count |
+-----+-----+
| Infosys   |      1 |
| TCS       |      2 |
| Wipro     |      0 |
+-----+-----+
3 rows in set (0.00 sec)
```

```
mysql> -- 13. Average salary per company excluding 'TCS'
mysql> select c.comp_name, avg(e.salary) as avg_salary
      -> from company c join emp_comp ec on c.comp_id=ec.comp_id
      -> join employee e on e.emp_id=ec.emp_id
      -> where c.comp_name <> 'TCS'
      -> group by c.comp_name;
+-----+-----+
| comp_name | avg_salary |
+-----+-----+
| Infosys   | 60000.000000 |
+-----+-----+
1 row in set (0.00 sec)

mysql>
mysql> -- 14. Employees with salary greater than average
mysql> select emp_name, salary from employee
      -> where salary > (select avg(salary) from employee);
+-----+-----+
| emp_name | salary   |
+-----+-----+
| Kavita   | 60000.00 |
+-----+-----+
1 row in set (0.00 sec)

mysql>
mysql> -- 15. Departments with no students
mysql> select d.dept_name
      -> from dept d
      -> where d.dept_id not in (select distinct dept_id from student);
Empty set (0.00 sec)

mysql>
```

### C. Insem 2025 Queries

```
mysql> create database A2_3;
Query OK, 1 row affected (0.01 sec)

mysql> use A2_3;
Database changed
mysql>
mysql> create table emp(
    ->     emp_no int primary key,
    ->     emp_name varchar(100),
    ->     dept_no int
    -> );
Query OK, 0 rows affected (0.03 sec)

mysql>
mysql> desc emp;
+-----+-----+-----+-----+
| Field | Type   | Null | Key | Default | Extra |
+-----+-----+-----+-----+
| emp_no | int    | NO   | PRI | NULL    |       |
| emp_name | varchar(100) | YES  |     | NULL    |       |
| dept_no | int    | YES  |     | NULL    |       |
+-----+-----+-----+-----+
3 rows in set (0.00 sec)

mysql> select * from emp;
Empty set (0.00 sec)

mysql>
mysql> create table dept_insem(
    ->     dept_no int primary key,
    ->     dept_name varchar(50)
    -> );
Query OK, 0 rows affected (0.02 sec)

mysql>
mysql> desc dept_insem;
+-----+-----+-----+-----+
| Field | Type   | Null | Key | Default | Extra |
+-----+-----+-----+-----+
| dept_no | int    | NO   | PRI | NULL    |       |
| dept_name | varchar(50) | YES  |     | NULL    |       |
+-----+-----+-----+-----+
2 rows in set (0.00 sec)

mysql> select * from dept_insem;
Empty set (0.00 sec)

mysql> insert into dept_insem (dept_no, dept_name) values
    -> (1,'Computer Science'),
    -> (2,'Information Technology'),
    -> (3,'Mechanical');
Query OK, 3 rows affected (0.00 sec)
Records: 3  Duplicates: 0  Warnings: 0
```

```
mysql> insert into emp (emp_no, emp_name, dept_no) values
    -> (1,'Ram',1),
    -> (2,'Shyam',2),
    -> (3,'Sita',1),
    -> (4,'Pooja',3);
Query OK, 4 rows affected (0.00 sec)
Records: 4  Duplicates: 0  Warnings: 0
```

```

mysql> select * from dept_insem;
+-----+-----+
| dept_no | dept_name |
+-----+-----+
|      1 | Computer Science |
|      2 | Information Technology |
|      3 | Mechanical |
+-----+-----+
3 rows in set (0.00 sec)

mysql> select * from emp;
+-----+-----+-----+
| emp_no | emp_name | dept_no |
+-----+-----+-----+
|      1 | Ram       |      1 |
|      2 | Shyam     |      2 |
|      3 | Sita      |      1 |
|      4 | Pooja    |      3 |
+-----+-----+-----+
4 rows in set (0.00 sec)

```

```

mysql> select dept_name from dept_insem
    -> where dept_no =
    ->     select dept_no from emp
    ->     where emp_name='Ram'
    -> );
+-----+
| dept_name      |
+-----+
| Computer Science |
+-----+
1 row in set (0.00 sec)

mysql>
mysql> select d.dept_name
    -> from emp e
    -> join dept_insem d on e.dept_no = d.dept_no
    -> where e.emp_name='Ram';
+-----+
| dept_name      |
+-----+
| Computer Science |
+-----+
1 row in set (0.00 sec)

mysql>
mysql>
mysql> create view emp_count_view as
    -> select d.dept_name, count(e.emp_no) as total_emp
    -> from dept_insem d
    -> left join emp e on d.dept_no = e.dept_no
    -> group by d.dept_name
    -> order by total_emp asc;
Query OK, 0 rows affected (0.00 sec)

mysql>
mysql> desc emp_count_view;
+-----+-----+-----+-----+-----+-----+
| Field   | Type      | Null | Key | Default | Extra |
+-----+-----+-----+-----+-----+-----+
| dept_name | varchar(50) | YES |   | NULL    |   |
| total_emp | bigint     | NO  |   | 0       |   |
+-----+-----+-----+-----+-----+
2 rows in set (0.00 sec)

```

```
mysql> select * from emp_count_view;
+-----+-----+
| dept_name | total_emp |
+-----+-----+
| Information Technology | 1 |
| Mechanical | 1 |
| Computer Science | 2 |
+-----+-----+
3 rows in set (0.00 sec)

mysql>
mysql> select dept_name from dept_insem
   -> where dept_no not in (select distinct dept_no from emp);
Empty set (0.00 sec)

mysql>
mysql> select d.dept_name
   -> from dept_insem d
   -> left join emp e on d.dept_no = e.dept_no
   -> where e.emp_no is null;
Empty set (0.00 sec)

mysql>
mysql> select dept_name from dept_insem
   -> except
   -> select d.dept_name
   -> from dept_insem d join emp e on d.dept_no=e.dept_no;
Empty set (0.00 sec)
```