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PROJECT ON

Employee Management System

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Agenda

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- Objective of the Project
- Schema explanation
- ER Diagram
- SQL query results with screenshots
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Business Problem Statement

The Employee Management System (EMS) is designed to efficiently manage employee information, job roles, departments, payroll, qualifications, and leave records within an organization. The system ensures data integrity through relational tables using foreign keys and cascading actions. It also supports analytical queries to provide insights into workforce distribution, salaries, bonuses, leave patterns, and payroll expenses—streamlining HR operations and decision-making.

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Objective of the Project

The objective of the Employee Management System project is to design a structured SQL-based system that efficiently manages employee data, job roles, salary details, qualifications, leave records, and payroll processing. The project aims to build a relational database that ensures data accuracy, supports analytical queries, and helps organizations generate useful insights for HR and management decision-making.

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The database contains **six interconnected tables**, each performing a specific function:

JobDepartment

Stores job roles, departments, and descriptions.

SalaryBonus

Contains salary, bonus, and annual pay for each job role.

Employee

Holds employee personal information, contact details, and job assignment.

Qualification

Maintains qualification, skills, and requirements for each employee's position.

Leaves

Tracks employee leave details such as date and reason.

Payroll

Combines employee, job, salary, and leave data to calculate final payments.

Foreign Key Relationships

The tables are connected using foreign keys with **CASCADE** and **SET NULL** rules to maintain data integrity.

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Job Department

Job_ID	jobdept	name	description	salaryrange
1	Operations	Operations Engineer	Responsible for engineer duties in the operation...	$70889 - $91502
2	Finance	Finance Consultant	Responsible for consultant duties in the finance ...	$45757 - $102274
3	IT	IT Coordinator	Responsible for coordinator duties in the IT dep...	$32637 - $118326
4	Marketing	Marketing Engineer	Responsible for engineer duties in the marketin...	$48936 - $145464
5	Finance	Finance Specialist	Responsible for specialist duties in the finance d...	$67562 - $99403
6	Engineering	Engineering Executive	Responsible for executive duties in the enginee...	$66000 - $125000
7	Sales	Sales Manager	Responsible for managing the sales department.	$75000 - $130000
8	IT	IT Analyst	Responsible for analyzing IT systems in the IT d...	$48000 - $92000
9	HR	HR Manager	Responsible for managing the human resources ...	$68000 - $105000
10	Operations	Operations Specialist	Responsible for specialist duties in the operatio...	$54000 - $90000
11	Marketing	Marketing Coordinator	Responsible for coordinating marketing campaig...	$55000 - $95000

Salary Bonus

salary_ID	Job_ID	amount	annual	bonus
1	1	45000.00	540000.00	5000.00
2	2	55000.00	660000.00	7000.00
3	3	40000.00	480000.00	4000.00
4	4	48000.00	576000.00	6000.00
5	5	47000.00	564000.00	4500.00
6	6	65000.00	780000.00	10000.00
7	7	80000.00	960000.00	12000.00
8	8	42000.00	504000.00	3500.00
9	9	55000.00	660000.00	7000.00
10	10	48000.00	576000.00	5500.00

Employee

emp_ID	firstname	lastname	gender	age	contact_add	emp_email	emp_pass	Job_ID
1	John	Doe	M	30	123 Elm St, NY	john.doe@example.com	password123	1
2	Jane	Smith	F	28	456 Maple Ave, CA	jane.smith@example.com	password123	2
3	Alice	Brown	F	35	789 Oak St, TX	alice.brown@example.com	password123	3
4	Bob	Johnson	M	40	101 Pine St, FL	bob.johnson@example.com	password123	4
5	Charlie	Williams	M	33	202 Birch Rd, IL	charlie.williams@example.com	password123	5
6	Dave	Miller	M	29	303 Cedar Blvd, NY	dave.miller@example.com	password123	6
7	Eve	Davis	F	25	404 Maple Dr, TX	eve.davis@example.com	password123	7
8	Frank	Wilson	M	38	505 Pine Ave, FL	frank.wilson@example.com	password123	8
9	Grace	Moore	F	45	606 Oak Blvd, CA	grace.moore@example.com	password123	9
10	Harry	Taylor	M	50	707 Elm Rd, NY	harry.taylor@example.com	password123	10
11	Irene	Anderson	F	32	808 Maple St, FL	irene.anderson@example.com	password123	11

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Qualification

QualID	Emp_ID	Position	Requirements	Date_In
1	1	HR Assistant	BBA Communication Skills	2019-12-06
2	2	HR Manager	MBA 5 Yrs Exp	2018-03-20
3	3	IT Support	B.Tech (IT) Troubleshooting	2020-01-15
4	4	Software Engineer	B.Tech (CS) Java/Python	2021-04-01
5	5	Data Analyst	B.Sc Stats Excel SQL	2020-08-11
6	6	Sr. Data Analyst	M.Sc Stats Power BI	2017-11-20
7	7	Marketing Executive	BBA Google Ads	2021-05-10
8	8	Marketing Manager	MBA Marketing 5 Yrs Exp	2018-07-14
9	9	Finance Analyst	B.Com Excel SAP	2020-02-19
10	10	Sr. Finance Officer	M.Com Chartered Accountant	2016-12-01
11	11	Legal Advisor	LLB Corporate Law	2015-10-09

Leaves

leave_ID	emp_ID	date	reason
1	1	2024-01-15	Medical Leave
2	2	2024-10-02	Personal Work
3	3	2024-05-03	Sick Leave
4	4	2024-01-25	Family Emergency
5	5	2024-10-03	Travel
6	6	2024-02-15	Medical Checkup
7	7	2024-01-04	Festival
8	8	2024-10-04	Vacation
9	9	2024-02-20	Illness
10	10	2024-05-01	Personal Work
11	11	2024-03-20	Medical Emergency

Payroll

payroll_ID	emp_ID	job_ID	salary_ID	leave_ID	date	report	total_amount
1	1	1	1	1	2024-04-30	April Payroll	40500.00
2	2	2	2	2	2024-04-30	April Payroll	45500.00
3	3	3	3	3	2024-04-30	April Payroll	39500.00
4	4	4	4	4	2024-04-30	April Payroll	43500.00
5	5	5	5	5	2024-04-30	April Payroll	38500.00
6	6	6	6	6	2024-04-30	April Payroll	42500.00
7	7	7	7	7	2024-04-30	April Payroll	44500.00
8	8	8	8	8	2024-04-30	April Payroll	45500.00
9	9	9	9	9	2024-04-30	April Payroll	40500.00
10	10	10	10	10	2024-04-30	April Payroll	38500.00
11	11	11	11	11	2024-04-30	April Payroll	49500.00

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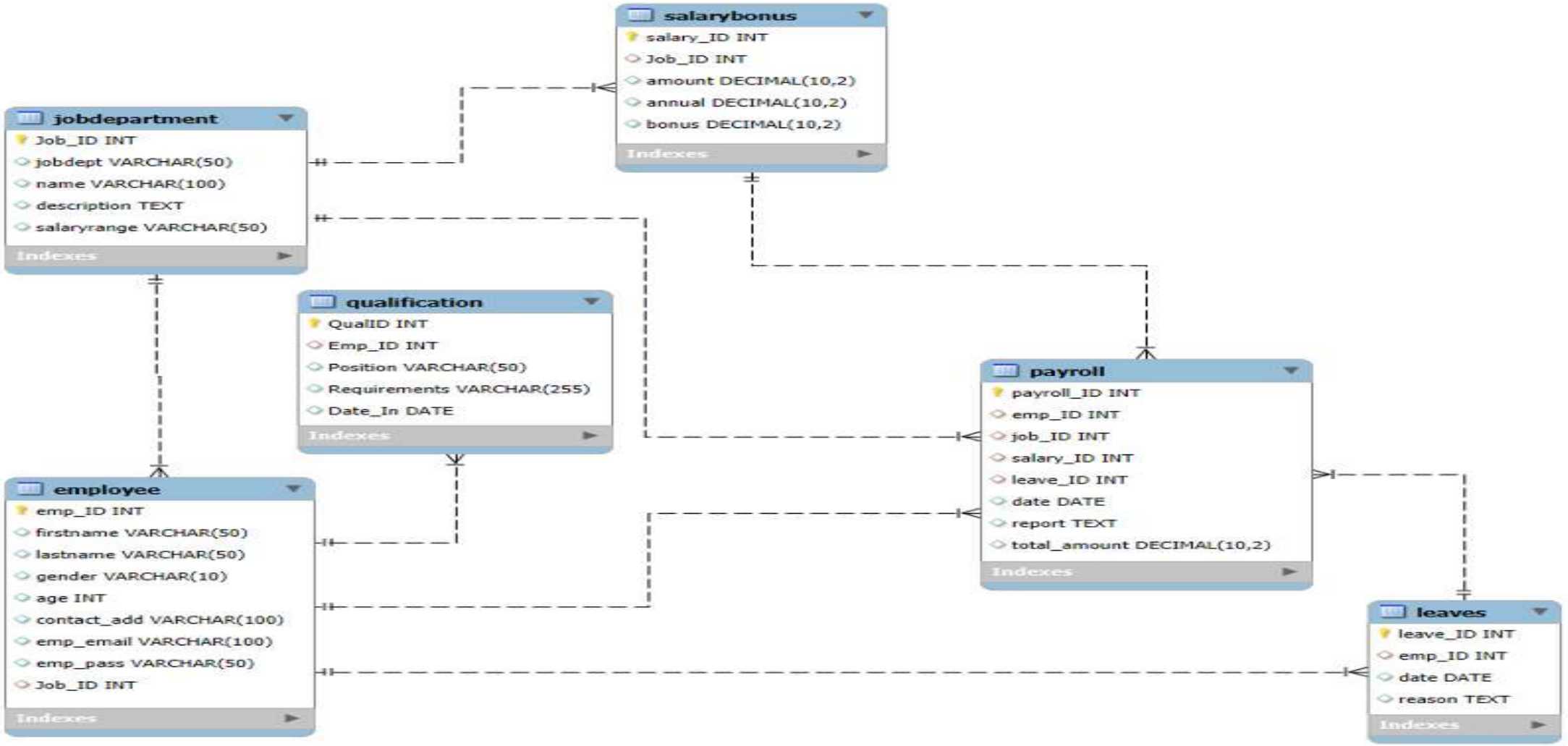
ER Diagram & Schema Explanation



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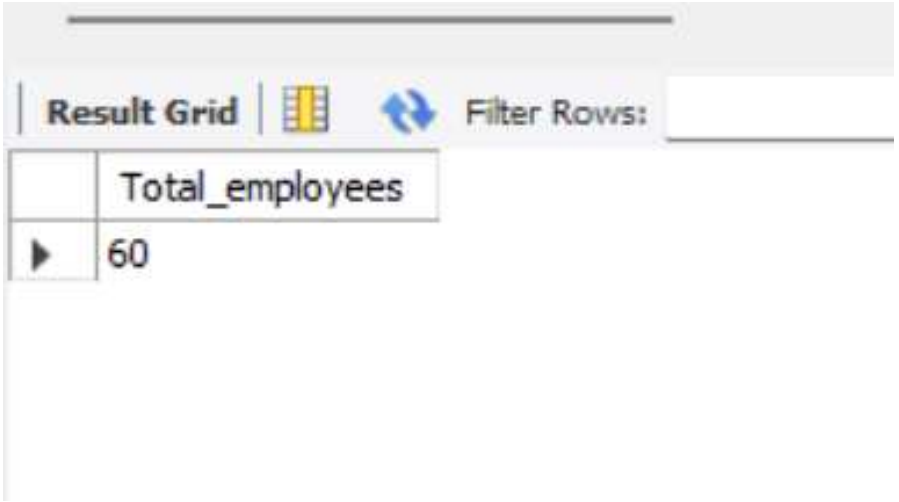
Key Analysis Questions

How many unique employees are currently in the system?

```
select count(*) as Total_employees from employee;
```



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Which departments have the highest number of employees?

```sql
SELECT j.jobdept AS department,
       COUNT(emp_ID) AS employee_count
FROM employee e
INNER JOIN jobdepartment j
ON e.job_ID = j.JOB_id
GROUP BY j.jobdept
ORDER BY employee_count DESC
LIMIT 5;
```

department	employee_count
Finance	9
IT	9
Operations	8
Marketing	8
Engineering	7

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What is the average salary per department?

```sql
SELECT j.jobdept AS department,
       ROUND(AVG(s.amount), 0) AS average_annual_salary
FROM jobdepartment j
INNER JOIN salarybonus s
ON s.Job_ID = j.Job_ID
GROUP BY j.jobdept;
```

department	average_annual_salary
Operations	68750
Finance	72333
IT	70889
Marketing	65625
Engineering	81143
Sales	75429
HR	62571
Legal	84600

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Who are the top 5 highest-paid employees?

```sql
SELECT Emp_id, FirstName, LastName, Salary
FROM (
    SELECT e.emp_ID AS Emp_ID,
           e.firstname AS FirstName,
           e.lastname AS LastName,
           s.amount AS Salary,
           DENSE_RANK() OVER(ORDER BY s.amount DESC) AS RNK
    FROM employee e
    INNER JOIN salarybonus s
    ON e.Job_ID = s.Job_ID
) SUB
WHERE RNK <= 5;
```

Emp_id	FirstName	LastName	Salary
37	Ingrid	Adams	170000.00
38	John	Baker	160000.00
35	Grake	Moor	150000.00
36	Hank	Wilson	150000.00
39	Kelly	Cooper	140000.00
34	Frank	Davis	135000.00

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What is the total salary expenditure across the company?

```
SELECT ROUND(SUM(annual + bonus)) AS total_salary_expenditure
FROM salarybonus;
```

total_salary_expenditure
52482700

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Which employees have taken the most leaves?

```sql
SELECT e.emp_ID,
       e.firstname,
       e.lastname,
       COUNT(l.leave_ID) AS total_leave_days
FROM employee e
JOIN leaves l ON e.emp_ID = l.emp_ID
GROUP BY e.emp_ID, e.firstname, e.lastname
ORDER BY total_leave_days DESC
LIMIT 5;
```

emp_ID	firstname	lastname	total_leave_days
1	John	Doe	1
2	Jane	Smith	1
3	Alice	Brown	1
4	Bob	Johnson	1
5	Charlie	Williams	1

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Final Business Insights & Recommendations

Key Insights

- Departments with more employees tend to have higher salary expenditure.
- Certain job roles offer higher salaries and bonuses, influencing employee retention.
- Leave patterns reveal workload stress or seasonal trends.
- Payroll variations reflect bonuses, leave deductions, and job hierarchy.

Recommendations

- Optimize resource allocation in departments with high salary expenditure.
- Offer training programs for roles requiring high qualifications.
- Implement better leave management practices to reduce productivity impact.
- Automate payroll to minimize manual errors and speed up processing.

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Challenges Working on SQL Project

- Designing the ER diagram and establishing correct foreign key connections was challenging initially.
- Writing multi-table JOIN queries required understanding relationships between tables.
- Ensuring data consistency during inserts, updates, and deletes needed careful planning.
- Handling date formats and generating time-based insights took additional effort.
- Overall, the project improved my SQL understanding, query optimization skills, and analytical thinking.

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Conclusion

The Employee Management System successfully demonstrates how SQL can organize and analyze large employee datasets. Through ER modeling, structured tables, and complex queries, the system provides valuable insights for HR decision-making, salary planning, and performance tracking. The project highlights the importance of relational databases in efficient workforce management.

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THANK YOU

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