SQL: Functions, GROUP BY and Joins

Standard difficulty · 20 questions · 40 marks · Time: 45 minutes

Name: _____ Date: _____ Score: ____ / 40

Show your working for Sections B and C. Answers are on the last page — try every question first!

Section A — Choose the correct answer — 8 × 1 = 8 marks

1. Which of these is NOT an aggregate function?

(a) AVG() **(b)** COUNT() **(c)** SUM() **(d)** LENGTH()

2. Table: EMPLOYEE

EmpNo | Name | Dept | Salary | Bonus
E1 | Ananya | IT | 50000 | 6500
E2 | Priya | IT | 73000 | NULL
E3 | Rohan | Accounts | 25000 | NULL
E4 | Zoya | Accounts | 86000 | 2500
E5 | Meera | Accounts | 31000 | 10000
E6 | Dev | Sales | 49000 | 3000
E7 | Isha | Sales | 81000 | 7500
E8 | Vikram | Sales | 29000 | NULL

SELECT MIN(Salary) FROM EMPLOYEE WHERE Dept = 'IT';
What does this query return?

(a) 8 **(b)** 73000 **(c)** 50001 **(d)** 50000

3. Table: ITEM

ICode | IName | Category | Price | Qty
I01 | Crayons | Writing | 60 | 75
I02 | Pen | Writing | 220 | 145
I03 | Eraser | Desk | 280 | 20
I04 | Folder | Paper | 65 | 70
I05 | Notebook | Paper | 130 | 55
I06 | Ruler | Desk | 95 | 35
I07 | Marker | Writing | 145 | 65
I08 | Pencil | Writing | 180 | 35

SELECT AVG(Price) FROM ITEM;
What does this query return?

(a) 146.8750 **(b)** 167.8571 **(c)** 1175 **(d)** 148.1250

4. Table: EMPLOYEE
EmpNo | Name | Dept | Salary | Bonus
E1 | Rohan | HR | 83000 | NULL
E2 | Ananya | Accounts | 67000 | 3500
E3 | Isha | Sales | 51000 | 10000
E4 | Priya | HR | 59000 | NULL
E5 | Rahul | HR | 75000 | 9500
E6 | Zoya | HR | 78000 | 10000
E7 | Vikram | Sales | 79000 | 9500

SELECT COUNT(*) FROM EMPLOYEE;
What does this return?

(a) 3 **(b)** 2 **(c)** 5 **(d)** 7

5. Table: ITEM
ICode | IName | Category | Price | Qty
I01 | Pencil | Writing | 210 | 140
I02 | Crayons | Writing | 40 | 20
I03 | Pen | Writing | 170 | 55
I04 | Stapler | Desk | 110 | 60
I05 | Eraser | Desk | 95 | 35
I06 | Folder | Paper | 195 | 50

SELECT Category, MAX(Price) FROM ITEM GROUP BY Category ORDER BY Category;
How many rows does this query return?

(a) 4 **(b)** 6 **(c)** 2 **(d)** 3

6. Table: EMPLOYEE
EmpNo | Name | Dept | Salary | Bonus
E1 | Ananya | HR | 40000 | 5500
E2 | Arjun | Sales | 29000 | 3000
E3 | Kabir | IT | 33000 | 7000
E4 | Rahul | Sales | 58000 | 4500
E5 | Asha | Sales | 47000 | NULL
E6 | Isha | Sales | 63000 | 9500

SELECT Dept, AVG(Salary) FROM EMPLOYEE GROUP BY Dept HAVING COUNT(*) > 2 ORDER BY Dept;
How many rows does this query return?

(a) 0 **(b)** 2 **(c)** 1 **(d)** 3

7. Table: EMP
EmpNo | Name | DeptID | Salary
101 | Ananya | D2 | 65000
102 | Asha | D2 | 32000
103 | Rahul | D4 | 26000
104 | Priya | D3 | 56000
105 | Arjun | D5 | 85000

Table: DEPT
DeptID | DName | City
D1 | IT | Pune
D2 | Accounts | Shimla
D3 | HR | Indore
D4 | Sales | Delhi

SELECT Name, City FROM EMP, DEPT WHERE EMP.DeptID = DEPT.DeptID ORDER BY Name;
How many rows does this query return?

(a) 3 **(b)** 4 **(c)** 20 **(d)** 5

8. Table: EMP
EmpNo | Name | DeptID | Salary
101 | Isha | D3 | 70000
102 | Zoya | D2 | 77000
103 | Meera | D1 | 29000
104 | Vikram | D1 | 47000
105 | Asha | D5 | 35000

Table: DEPT
DeptID | DName | City
D1 | HR | Shimla
D2 | Accounts | Indore
D3 | IT | Jaipur
D4 | Sales | Pune

SELECT * FROM EMP NATURAL JOIN DEPT; How many columns does it return?

(a) 6 **(b)** 7 **(c)** 12 **(d)** 9

Section B — Short answer 8 × 2 = 16 marks

9. Name the five aggregate functions of SQL.

10. Table: EMPLOYEE
EmpNo | Name | Dept | Salary | Bonus
E1 | Zoya | HR | 74000 | 4000
E2 | Rahul | Sales | 67000 | 5500
E3 | Ananya | HR | 60000 | NULL
E4 | Dev | Sales | 41000 | 4000
E5 | Meera | HR | 44000 | 8500
E6 | Priya | IT | 27000 | 9500

SELECT SUM(Bonus) FROM EMPLOYEE WHERE Dept = 'HR';
What does this query return?

11. Table: STUDENT
RollNo | Name | Sec | City | Marks
101 | Isha | B | Shimla | 48
102 | Rahul | B | Shimla | 46
103 | Asha | A | Pune | 60
104 | Arjun | B | Pune | 71
105 | Rohan | A | Shimla | 97
106 | Meera | C | Indore | 93
107 | Zoya | B | Shimla | 86
108 | Vikram | B | Shimla | 44

SELECT Sec, MAX(Marks) FROM STUDENT GROUP BY Sec ORDER BY Sec;
Write the output.

12. Table: ITEM
ICode | IName | Category | Price | Qty
I01 | Pen | Writing | 255 | 105
I02 | Notebook | Paper | 75 | 110
I03 | Pencil | Writing | 260 | 65
I04 | Marker | Writing | 155 | 20
I05 | Stapler | Desk | 170 | 95
I06 | Diary | Paper | 95 | 120

SELECT Category, SUM(Price) FROM ITEM GROUP BY Category HAVING SUM(Price) > 170 ORDER BY Category;
Write the output.

13. Table: EMP
EmpNo | Name | DeptID | Salary
101 | Rahul | D3 | 38000
102 | Priya | D3 | 28000
103 | Rohan | D1 | 59000
104 | Zoya | D2 | 78000
105 | Meera | D4 | 30000

Table: DEPT
DeptID | DName | City
D1 | HR | Pune
D2 | Sales | Indore
D3 | Accounts | Shimla

SELECT Name, City FROM EMP, DEPT WHERE EMP.DeptID = DEPT.DeptID ORDER BY Name;
Write the output.

14. Table: EMPLOYEE
EmpNo | Name | Dept | Salary | Bonus
E1 | Arjun | HR | 42000 | NULL
E2 | Dev | HR | 27000 | 7000
E3 | Vikram | HR | 55000 | NULL
E4 | Priya | Sales | 76000 | 2000
E5 | Isha | Accounts | 48000 | 9000
E6 | Meera | Accounts | 41000 | 5500
E7 | Zoya | HR | 78000 | 9000
What do (a) SELECT COUNT(*) FROM EMPLOYEE; and (b) SELECT COUNT(Bonus) FROM EMPLOYEE; return?

15. Table: EMPLOYEE
EmpNo | Name | Dept | Salary | Bonus
E1 | Dev | HR | 38000 | NULL
E2 | Arjun | Accounts | 52000 | 5000
E3 | Vikram | HR | 26000 | 9500
E4 | Isha | HR | 54000 | 6000
E5 | Ananya | IT | 40000 | 7000
E6 | Meera | HR | 89000 | 9500
E7 | Rohan | Accounts | 88000 | NULL
E8 | Asha | HR | 57000 | 3000

SELECT Name FROM EMPLOYEE WHERE Bonus IS NULL ORDER BY Name;
Write the names it returns, in order, separated by commas.

16. Table: EMP
EmpNo | Name | DeptID | Salary
101 | Meera | D1 | 83000
102 | Rahul | D2 | 46000
103 | Priya | D3 | 36000
104 | Ananya | D3 | 69000
105 | Arjun | D2 | 28000
106 | Rohan | D4 | 73000

Table: DEPT
DeptID | DName | City
D1 | Accounts | Shimla
D2 | HR | Delhi
D3 | Sales | Jaipur
For SELECT * FROM EMP, DEPT; find (a) the number of rows (b) the number of columns.

Section C — Word problems — 4 × 4 = 16 marks

17. Explain the five aggregate functions with an example of each on ITEM(ICode, IName, Category, Price, Qty).

18. Write the output of each query.

(a)

Table: ITEM

ICode | IName | Category | Price | Qty

I01 | Ruler | Desk | 185 | 130

I02 | Glue | Desk | 200 | 20

I03 | Stapler | Desk | 160 | 65

I04 | Notebook | Paper | 35 | 120

I05 | Marker | Writing | 75 | 115

I06 | Sharpener | Desk | 245 | 105

I07 | Diary | Paper | 70 | 120

I08 | Folder | Paper | 45 | 35

SELECT Category, COUNT(*) FROM ITEM GROUP BY Category HAVING COUNT(*) > 2 ORDER BY Category;

(b)

Table: STUDENT

RollNo | Name | Sec | City | Marks

1 | Rahul | B | Jaipur | 70

2 | Rohan | C | Pune | 55

3 | Dev | B | Jaipur | 60

4 | Ananya | B | Jaipur | 85

5 | Isha | C | Jaipur | 69

6 | Arjun | B | Jaipur | 84

SELECT COUNT(DISTINCT Sec) FROM STUDENT WHERE Sec IN ('B', 'C');

19. Table: EMP
EmpNo | Name | DeptID | Salary
101 | Arjun | D1 | 72000
102 | Dev | D1 | 52000
103 | Ananya | D4 | 34000
104 | Meera | D4 | 46000
105 | Rohan | D5 | 83000

Table: DEPT
DeptID | DName | City
D1 | Accounts | Jaipur
D2 | IT | Kochi
D3 | Sales | Shimla
D4 | HR | Indore

SELECT Name, City FROM EMP, DEPT WHERE EMP.DeptID = DEPT.DeptID ORDER BY Name;
(a) Write the output. (b) How many rows would SELECT * FROM EMP NATURAL JOIN DEPT; return, and how many columns? (c) What is the difference between an equi-join and a natural join?

20. Table: EMPLOYEE
EmpNo | Name | Dept | Salary | Bonus
E1 | Priya | HR | 52000 | 8000
E2 | Meera | IT | 39000 | 1500
E3 | Ananya | HR | 82000 | 8500
E4 | Rahul | HR | 53000 | NULL
E5 | Arjun | HR | 60000 | 5000
E6 | Asha | HR | 67000 | NULL
Write SQL queries to display (a) the number of employees in each department; (b) the highest and lowest salary in HR; (c) the departments whose total salary is more than 100000; (d) the names of employees who get no bonus.

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Answer key

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Q	Answer	Working
1	**(d) LENGTH()**	—
2	**(d) 50000**	MIN(Salary) over rows where Dept = 'IT'
3	**(a) 146.8750**	1175 ÷ 8; AVG skips NULL
4	**(d) 7**	COUNT(*) counts rows
5	**(d) 3**	one row for each Category: Desk, Paper, Writing
6	**(c) 1**	groups: HR 40000.0000; IT 33000.0000; Sales 49250.0000; HAVING keeps 1
7	**(b) 4**	only pairs with equal DeptID (and the extra condition) are kept
8	**(a) 6**	NATURAL JOIN shows the common column DeptID once
9	**COUNT(), SUM(), AVG(), MIN() and MAX().**	—
10	**12500**	SUM(Bonus) over rows where Dept = 'HR'; NULL is skipped
11	**Sec | MAX(Marks)** **A | 97** **B | 86** **C | 93**	one row per Sec
12	**Category | SUM(Price)** **Writing | 670**	groups before HAVING: Desk 170; Paper 170; Writing 670
13	**Name | City** **Priya | Shimla** **Rahul | Shimla** **Rohan | Pune** **Zoya | Indore**	pair each EMP row with the DEPT row of the same DeptID
14	**(a) 7; (b) 5**	2 Bonus values are NULL, and COUNT(column) skips NULL
15	**Dev, Rohan**	NULL is tested with IS NULL, never with = NULL; 2 such rows
16	**(a) 18; (b) 7**	6 × 3 rows; 4 + 3 columns
17	**COUNT(*) gives the number of items; SUM(Qty) the total quantity; AVG(Price) the mean price; MIN(Price) the cheapest price; MAX(Price) the dearest. Each returns one value for the rows selected, ignoring NULL.**	—
18	**(a)** **Category | COUNT(*)** **Desk | 4** **Paper | 3** **(b) 2**	WHERE filters rows before grouping; HAVING filters groups after

Q	Answer	Working
19	**(a)** **Name | City** **Ananya | Indore** **Arjun | Jaipur** **Dev | Jaipur** **Meera | Indore** **(b) 4 rows, 6 columns; (c) an equi-join keeps both copies of the common column; a natural join shows it once.**	join on equal DeptID
20	**(a) SELECT Dept, COUNT(*) FROM EMPLOYEE GROUP BY Dept; (b) SELECT MAX(Salary), MIN(Salary) FROM EMPLOYEE WHERE Dept = 'HR'; (c) SELECT Dept FROM EMPLOYEE GROUP BY Dept HAVING SUM(Salary) > 100000; (d) SELECT Name FROM EMPLOYEE WHERE Bonus IS NULL;**	GROUP BY with an aggregate; HAVING for a condition on groups; IS NULL