

**BACHELOR OF ENGINEERING IN  
PRINTING ENGINEERING  
EXAMINATION, 2023  
(3<sup>rd</sup> YEAR, 2<sup>nd</sup> SEMESTER)**

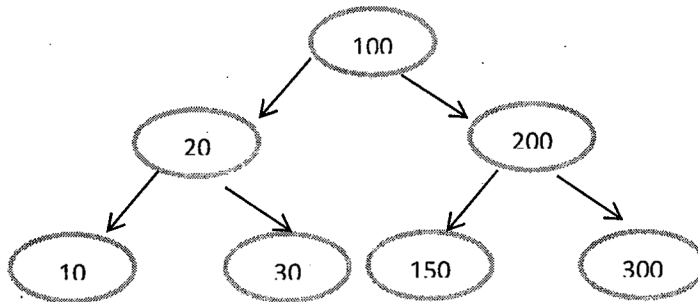
**DATABASE MANAGEMENT SYSTEM**

Time: 3 Hours

Full Marks: 100

**Section - A (Any One)**

- Q1 a) In a heap sort, after deleting the last minimum element, the array will contain elements in which order? Explain why.
- b) Show stepwise the insertion of the following elements in an AVL tree. Also shade the critical elements, if any. 63, 81, 19, 27, 18, 108, 99, 84
- c) What is Binary Search Tree? Explain with example.
- d) Give the post order traversal of the following BST.



2+4+2+2

- Q2 a) Show stepwise how do we apply quicksort on the following data. Also shade the pivot element in every step. 12, 3, 1, 6, 23, 7
- b) Explain with proper diagram the properties of stack and queue.

[ Turn over

c) "All trees are graphs but all graphs are not trees." Do you agree or disagree with this. Explain.

d) State 2 differences between B tree and B+ tree.

3+2+3+2

**Section - B (Any One)**

Q1 a) What are keys? Why do we need a key?

b) What is the difference between a Primary key and a Foreign Key?

c) Define and explain the following with examples.

i) Super Key    ii) Candidate Key    iii) Composite Key

d) Explain the different types of integrity constraints with examples.

e) Mention 3 issues with traditional file based systems that make database management system a better choice.

f) Explain the different levels of data abstraction in a DBMS.

g) Give 2 examples of Data Definition Language (DDL).

2+2+(2+2+2)+ 3+3+3+1

Q2 a) What is meant by ACID properties in DBMS?

b) Are Null values in a database the same as that of blank space or zero? Explain.

c) Give an example of an abort state in a transaction.

d) What are tuples and attributes in a DBMS?

e) Explain the following terms.

i) data

ii) database

iii) database management system

iv) entity

v) E-R model

f) What do you understand by correlated sub-queries in DBMS?

6+2+2+3+5+2

**Section - C (Any One)**

Q1 a) Create an E-R diagram for each of the following descriptions.

- i) Each company operates four departments and each department belongs to one company.
- ii) Each department in (i) employs one or more employees and each employee works for one department.
- iii) Each of the employees in part (ii) may or may not have one or more dependents and each dependent belongs to one employee.
- iv) Each employee in part (iii) may or may not have an employment history.
- v) Represent all the E-R diagrams described in (i), (ii), (iii) and (iv) as a single E-R diagram.

b) Reduce the E-R diagram into tables. Explain with proper diagram.

c) Explain the following with examples.

- i) composite attribute
- ii) multivalued attribute
- iii) derived attribute

d) Give the symbol that represents entity set and derived attributes.

(1+1+1+1+5)+3+(2+2+2)+2

Q2 a) What does the diamond symbol represents in an E-R diagram?

b) Differentiate between strong and weak entity. Explain with example.

c) What type of query language does the following SQL belong to?

Select regno, name, dob from students where gender='F';

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d) Suppose there are 2 entity sets A and B with attributes a1, a2, a3 and b1, b2, b3 respectively. Here a1 is the key for A and b2 is the key for B. If there exist a one-to-many relationship R from A to B with an attribute r1, what would be the schema for R after converting E-R diagram into schemas? Give reason.

e) Draw an E-R model for library management application considering the following constraints.

- In a library multiple students can enroll.
- Students can become a member by paying an appropriate fee.
- The books in the library are identified by a unique ID.
- Students can borrow multiple books from subscribed libraries.

- i) Identify the entity sets.
- ii) Identify the attributes for the given entities
- iii) Identify the key attributes
- iv) Identify the relationships between entity sets
- v) Construct the complete E-R diagram

f) What are constraints in DBMS? Why do we need it? Name 2 different types of constraints.

1+3+1+3+(1+1+1+1+5)+(1+1+1)

#### Section - D (Any One)

Q1 a) What is normalization?

b) How is normalization different from demoralization?

c) Explain 'deletion anomaly' with an example.

d) What do you mean by non-prime attributes? Explain.

e) Write the conditions for a relation to be in BCNS form.

f) Find the highest normal form of a relation (A, B, C, D, E) with FD set as

{ BC -> D, AC -> BE, B -> E }

g) Explain the term functional dependency.

2+2+3+3+2+5+2

- Q2
- What is the use of normalization?
  - Explain the conditions for a relation to be in 3NF.
  - What is natural join? Explain with examples. Why do we need this operator?
  - Discuss the following terms wrt normal forms with suitable example. Suggest a method to overcome it.
    - Insertion anomaly
    - Deletion anomaly
    - Updation anomaly
  - What is transitive dependency? Explain with example.
  - Find whether the following relation is in 3NF? Give reasons.

R (A, B, C, D, D) with FD set { B → A, A → C, BC → D, AC → BE }

1+2+(1+2+1)+6+2+5

**Section - E (Any One)**

- Q1
- What is the importance of null value in a table?
  - What is a trigger? Give 3 examples of SQL trigger.
  - What is the difference between delete, drop and truncate? Explain with an example.
  - Which SQL command is used to add a column in a database? Explain with example.
  - Consider the following schemas.

Employee (emp\_id, emp\_name, dept, cont\_no, email\_id, empid\_head)

EmpDept (dept\_id, dept\_name, dept\_off, dept\_head)

EmpSalary (emp\_id, salary, is\_permanent)

Table name: Employee

emp_id	emp_name	dept	cont_no	email_id	empid_head
101	Isha	E-101	1234567890	<a href="mailto:isha@gmail.com">isha@gmail.com</a>	105
102	Priya	E-104	2345678901	<a href="mailto:priya@yahoo.com">priya@yahoo.com</a>	103
103	Neha	E-101	3456789012	<a href="mailto:neha@gmail.com">neha@gmail.com</a>	101
104	Rahul	E-102	4567890123	<a href="mailto:rahul@yahoo.com">rahul@yahoo.com</a>	105

105	Abhishek	E-101	5678901234	abhisek@gmail.com	102
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Table name:EmpDept

dept_id	dept_name	dept_off	dept_head
E-101	HR	Monday	105
E-102	Development	Tuesday	101
E-103	House Keeping	Saturday	103
E-104	Sales	Sunday	104
E-105	Purchase	Tuesday	104

Table name: EmpSalary

emp_id	Salary	is_permanant
101	2000	Yes
102	10000	Yes
103	5000	No
104	1900	Yes
105	2300	Yes

Write down SQL queries for the following.

- i) Create EmpDept table clearly stating the necessary constraints.
- ii) How many permanent candidates take salary more than 5000?
- iii) Select the name of the employee who is working under Abhishek?

f) Explain commit and rollback operations that are used in database management system.

g) What is the meaning of aborted transaction?

2+2+4+2+(2+2+2)+3+1

Q2 a) What are aggregate functions? Give 2 examples and explain .

b) Write 2 differences between JOIN and UNION.

c) When should we use 'Having' clause in SQL? Explain with example.

d) Consider the following schemas.

Employee (emp\_id, emp\_name, dept, cont\_no, email\_id, empid\_head)

EmpDept (dept\_id, dept\_name, dept\_off, dept\_head)

EmpSalary (emp\_id, salary, is\_permanant)

Table name: Employee

emp_id	emp_name	dept	cont_no	email_id	empid_head
101	Isha	E-101	1234567890	<a href="mailto:isha@gmail.com">isha@gmail.com</a>	105
102	Priya	E-104	2345678901	<a href="mailto:priya@yahoo.com">priya@yahoo.com</a>	103
103	Neha	E-101	3456789012	<a href="mailto:neha@gmail.com">neha@gmail.com</a>	101
104	Rahul	E-102	4567890123	<a href="mailto:rahul@yahoo.com">rahul@yahoo.com</a>	105
105	Abhishek	E-101	5678901234	<a href="mailto:abhisek@gmail.com">abhisek@gmail.com</a>	102

Table name:EmpDept

dept_id	dept_name	dept_off	dept_head
E-101	HR	Monday	105
E-102	Development	Tuesday	101
E-103	House Keeping	Saturday	103
E-104	Sales	Sunday	104
E-105	Purchase	Tuesday	104

Table name: EmpSalary

emp_id	Salary	is_permanant
101	2000	Yes
102	10000	Yes
103	5000	No
104	1900	Yes
105	2300	Yes

Write down SQL queries for the following.

- i) Select name of employee who is the department head of HR.
- ii) Select name and email\_id of the department head who is not permanent.
- iii) How many employees have a holiday on Monday?
- iv) Name the department with maximum number of employees.

e) What is scheduling? Why do we need scheduling? Explain with example.

$$(1+2+2)+2+3+(2+2+2+2)+(1+1+2)$$

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**Section - F (All Compulsory)**

Q1 Find the errors and rewrite the correct form.

- a) Select emp\_name from Employees  
 where emp\_Category='devops'  
 order by emp\_name  
 group by branch\_code  
 having count(\*)=1;
- b) Select \* from products  
 where manuf\_date BETWEEN '2020-04-01' AND '2020-05-01';

1+1

Q2 Write down the pseudo code for selection sort.

3

Q3 Write down the output of the following C program. Explain your answer.

```
#include<stdio.h>
int main()
{
    char arr[]={ 'A' , 'B' , 'c' , 'd' , 'E' , 'f' };
    int size = sizeof(arr)/sizeof(arr[0]);
    printf("%d\n",size);
    return 0;
}
```

2

Q4 Write down the output of the following queries based on the given tables.

Table name: Employee

emp_id	emp_name	dept	cont_no	email_id	empid_head
101	Isha	E-101	1234567890	<a href="mailto:isha@gmail.com">isha@gmail.com</a>	105
102	Priya	E-104	2345678901	<a href="mailto:priya@yahoo.com">priya@yahoo.com</a>	103
103	Neha	E-101	3456789012	<a href="mailto:neha@gmail.com">neha@gmail.com</a>	101
104	Rahul	E-102	4567890123	<a href="mailto:rahul@yahoo.com">rahul@yahoo.com</a>	105
105	Abhishek	E-101	5678901234	<a href="mailto:abhisek@gmail.com">abhisek@gmail.com</a>	102

Table name:EmpDept

dept_id	dept_name	dept_off	dept_head
E-101	HR	Monday	105
E-102	Development	Tuesday	101
E-103	House Keeping	Saturday	103
E-104	Sales	Sunday	104
E-105	Purchase	Tuesday	104



Table name: EmpSalary

emp_id	Salary	is_permanant
101	2000	Yes
102	10000	Yes
103	5000	No
104	1900	Yes
105	2300	Yes

- a) Select emp\_id, emp\_name from Employee where dept in ('E-102' , 'E-104');
- b) Select sum(salary).as Salary from EmpSalary where is\_permanant='yes';
- c) Select emp\_name from Employee where emp\_name like '%a';

1+1+1