



**CICT PART II SECTION 3  
DATABASE SYSTEMS**

**WEDNESDAY: 29 November 2017.**

**Time Allowed: 3 hours.**

**Answer ALL questions. Marks allocated to each question are shown at the end of the question.**

**QUESTION ONE**

- (a) Citing their goals, differentiate between homogeneous and heterogeneous distributed databases. (4 marks)
- (b) Explain four important factors that should be considered in the design of parallel databases. (4 marks)
- (c) Distinguish between the following kind of indexes:
  - (i) "Ordered" and "hash" indexes. (2 marks)
  - (ii) "Dense" and "sparse" indexes. (2 marks)
- (d) Speed-up is one of the optimisation techniques in distributed parallel databases:
 

**Required:**

  - (i) Explain how speed-up in a distributed parallel database is achieved. (2 marks)
  - (ii) Express the formula for the computation of speed-up in a distributed parallel database. (2 marks)
- (e) Distinguish between embedded Structured Query Language (SQL) and Dynamic SQL. (4 marks)

**(Total: 20 marks)**

**QUESTION TWO**

Study the tables titled 'VotersRecords' and 'Provinces' below and answer the questions that follow:

**VotersRecords**

CandidateName	NoOfVotes	Party	ProvinceID
A	20122	Green	P001
B	32333	White	P002
A	20909	Green	P003
A	31789	Green	P002
B	32532	White	P004
B	43332	White	P003
A	2424	Green	P004
B	15212	White	P001

**Provinces**

ProvinceID	ProvinceName
P001	East
P002	West
P003	North
P004	South
P005	Central

**Required:**

- (a) Write Structured Query Language (SQL) statement for displaying all databases in the DBMS. (1 mark)
- (b) The 'Provinces' table, is missing a column by the name 'Country'. Write an SQL statement to modify the table and add a column called 'Country' of datatype 'varchar' and can hold a length of 25 characters. (2 marks)
- (c) Write SQL statement that will update all the records in the new column added in (b) above to 'Kenya'. (2 marks)
- (d) In the 'provinces' table, central province was added erroneously.  
Write an SQL statement that will delete this record. (2 marks)
- (e) Write an SQL statement that will display the name of the candidate, the party and the provinces.  
The records should be grouped by candidate's name. (3 marks)
- (f) Write an SQL statement that will display the name of candidate, sum of votes of each candidate and the name of the party. (3 marks)
- (g) Write an SQL statement to display the province that candidate A got the least number of votes. (3 marks)
- (h) Highlight four application areas of multimedia databases. (4 marks)
- (Total: 20 marks)**

**QUESTION THREE**

- (a) Study the following relationship schema:

Supplier (supplier\_id:integer, s\_name:string, address:string)  
Parts (part\_id:integer, supplier\_id:integer, p\_name:string, color:string)  
Inventory (inventory\_id:integer, part\_id:integer, cost: integer)

**Required:**

- (i) Write a query in relational algebra to find names of suppliers who supply red parts. (3 marks)
- (ii) Write SQL code from the relational algebra query in (a)(i) above. (4 marks)
- (b) As a database administrator, it is important to measure performance of a database. List two tools for doing this job. (2 marks)
- (c) Highlight three problems solved in the process of database monitoring. (3 marks)
- (d) Describe two functions of MySQL connector used when integrating VB.NET with MySQL database system. (4 marks)
- (e) Differentiate between "integrity constraint" and "domain constraint" in the context of database systems. (4 marks)
- (Total: 20 marks)**

**QUESTION FOUR**

- (a) Distinguish between the terms "simplicity" and "minimality" as used in database design. (4 marks)
- (b) (i) Describe an example of functional dependency in database systems. (2 marks)
- (ii) Explain transitivity as used in functional dependency. (2 marks)
- (c) Citing two examples explain the term "composite attributes" as used in data modelling. (4 marks)
- (d) Database security is paramount.

**Required:**

List four capabilities of the superuser account in database management system (DBMS). (4 marks)

- (e) Explain when the lost update problem and dirty read occurs. (4 marks)

**(Total: 20 marks)**

**QUESTION FIVE**

(a) Consider the following transactions,  $T_0$  and  $T_1$ :

$T_0$  executes before  $T_1$  and initial values are as follows:  $A = 100$ ,  $B = 200$  and  $C = 700$ .

$T_0$ : read (A)  
A = A - 50  
write (A)  
read (B)  
B = B + 50  
write (B)

$T_1$ : read (C)  
C = C - 100  
write (C)

**Required:**

- (i) Describe the log-based recovery approach used. (2 marks)
- (ii) Extract the corresponding log record after the transactions execute to completion. (6 marks)
- (b) Explain the term "data governance" in the context of database systems. (2 marks)
- (c) Discuss three scenarios where a view could be helpful in a database management system. (6 marks)
- (d) Using an example, describe "basket analysis" in context of database technology. (4 marks)

**(Total: 20 marks)**

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