



University of Ruhuna- Faculty of Technology
Bachelor of Information & Communication Technology Honours Degree
Level 03 (Semester II) Examination, November/December 2025
Academic year 2023/2024

Course Unit: ICT 3273 - Advanced Database Management Systems (Written)
(Old Curriculum) Duration: 02 hours

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This Theory examination paper contains **04 pages** including this instruction page.

IMPORTANT INSTRUCTIONS:

1. The medium of this examination is **English**.
2. This is a Closed Book examination.
3. This Examination consists of **four (04) questions** that are given equal marks.
4. You must answer **all four (04) questions** in this examination.

Question 01

- a) Briefly define the concept of **file organization** in the context of databases. [15 Marks]
- b)
- Write down *two (02)* advantages of **heap file** organization. [10 Marks]
 - Write down *two (02)* disadvantages of **sequential file** organization. [10 Marks]
- c) Explain briefly **main drawback** of the **Static Hashing**. [10 Marks]
- d) List down *three (03)* properties of a good hash function. [15 Marks]
- e) A hash table of *size 10* uses linear probing to resolve collisions. Insert the following eight keys into the hash table in the given order using the following hash function. [24 Marks]
Keys: 23, 45, 12, 39, 27, 32, 52, 29
The hash function: $h(\text{key}) = \text{key} \bmod 10$
- f) List down *two (02)* main disadvantages of the Extendable Hashing. [16 Marks]

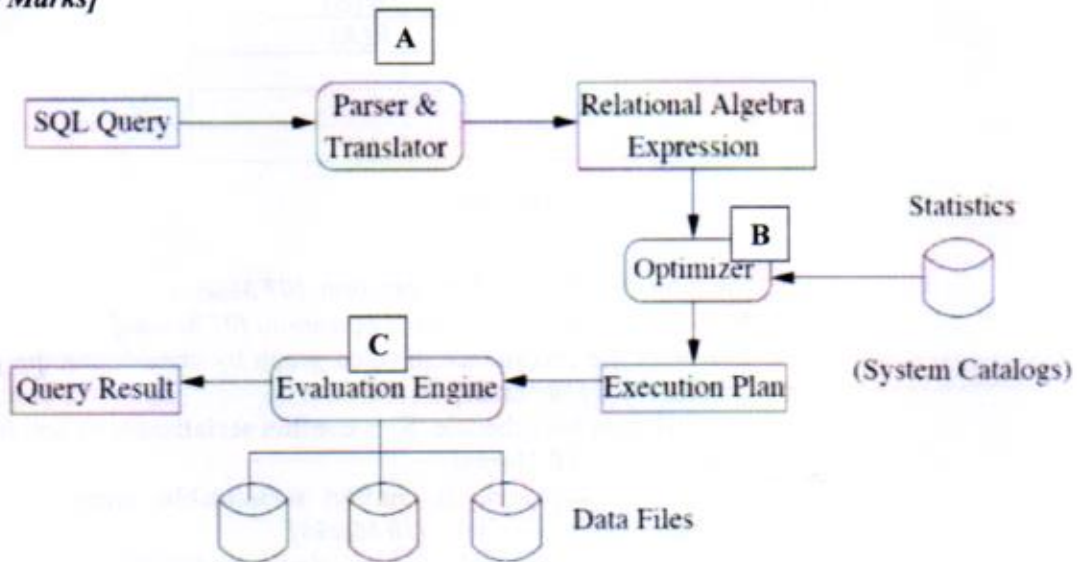
Question 02

- a) Why is the concept of **indexing** important in the context of the database systems? [10 Marks]
- b) Briefly explain the concept of the **clustering index** using a suitable example with a block diagram. [15 Marks]
- c) What is meant by **multi-level indexing** in databases? [10 Marks]
- d) Differentiate between **B-tree** and **B+ tree** with respect to their *node structure* and the *height of the tree*. [20 Marks]
- e) Consider a B+ Tree with the following values:
Block size – 2048 bytes.
Search key size – 12 bytes.
Record pointer size – 16 bytes.
Block pointer size – 16 bytes.

Find the maximum number of keys that can be stored in a non-leaf internal node. [15 marks]
- f) Construct a B+ Tree by using the given key values below. Assume that the fanout of the B+ Tree is 04. [30 marks]
2, 3, 6, 7, 10, 16, 17, 22, 27, 31

Question 03

- a) Briefly define what is meant by **query optimization**? [10 Marks]
- b) Consider the Diagram Given below, and explain the role of each unit named **A**, **B**, and **C**. [20 Marks]



- c)
- What is meant by **heuristic query optimization**? [10 Marks]
 - Mention **three (03)** rules of the heuristic query optimization. [30 Marks]
- d) Briefly explain how a **block nested loop** join differs from a **nested loop** join in query processing. [10 Marks]
- e) Mention **one (01)** difference between **Materialized evaluations** and **Pipeline evaluations** in Query optimization. [10 Marks].

Question 04

- a) Briefly define what is meant by a **transaction** in the context of the database systems. [10 Marks]
- b) Describe the properties of a transaction. [20 Marks]
- c) Consider the **three (03)** transactions T1, T2, T3 and the schedule 'S' given below. [40 Marks]

T1	T2	T3
R(A)		
W(A)		
	R(A)	
	W(B)	
R(C)		
	R(C)	
		W(B)
		R(A)
	W(C)	
		R(C)

Schedule S

- i. Mention **one (01)** conflict operation. **[07 Marks]**
- ii. Mention **one (01)** non-conflict operation. **[07 Marks]**
- iii. Construct the precedence directed graph by considering the given schedule 'S'. **[10 Marks]**
- iv. State whether the schedule 'S' is **conflict serializable** or not. Justify your answer. **[10 Marks]**
- v. If the given schedule is **conflict serializable**, write down the equivalent serial schedule. **[10 Marks]**
- vi. State whether the schedule 'S' is **view serializable** or not. Justify your answer. **[10 Marks]**

- d) Differentiate between **deferred update** and **immediate update** using **two (02)** key points.

[16 Marks]

*****End of the Paper*****