BUE The British University In Egypt الجامعة البريطانية في مصر Informatics and Computer Science	Examination Paper Proofing & Printing Confirmation Sheet
Module Title: **Database ||**	Module Code: **19CSIS05I**
Module Leader **Dr. Marwa Salah, Dr. Nermin Abdel-Hakim**	Semester **One**
Proofed by **Ashraf. S. Hussein**	

	Proof-reader comments
Spelling and Grammar	- - - -
Template	- - - -
Marking schema	- - - -
ILOs matching	- - - -
Any Other Comments	- - - -

- This examination paper has been proof-read (spelling and grammar) [*]

- This examination paper follows the approved template [*]

- All questions (and sub questions) have their marks specified [*]

- Appropriate model answers were provided with breakdown of marks [*]

- This examination paper assesses the ILOs for the module [*]

- ILOs Matrix is included [*]

Signed (Proof Reader): Ashraf. S. Hussein_____

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I hereby confirm that

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Printing instructions & stationery requirements

Number of copies of examination paper to be printed		
Date of examination		
		Number required per student
Stationery Requirement(s)	8 page answer book	
	12 page answer book	
	Graph paper	
	Other	

Signed (Module Leader): Dr. Marwa Salah, Dr. Nermin Abdel-Hakim

Instructions to students:

- The exam paper is **4** pages long.

- Answer **all** questions

- The allocation of marks is shown in brackets by the questions.

- The total mark of the exam is 100 marks.

[Turn Over *(only when instructed to do so)*]

Answer **all** Questions

Q1   Define the following terms

a. Total Query Cost

b.   RRN

c. Rotational delay:

d. Fixed length record

e. Hash function

[10 marks]
[2 marks for each definition]

Q2. Answer the following questions:

a. Compare between open addressing and the Chaining hashing techniques emphasizing the different aspects and features. Provide example to support your answer

[6 marks]
[3 mark for each technique]

b. Provide an example for the Primary index and the Secondary

index. Illustrating the index and the data file.

[6 marks]

[3 mark for each drawing]

c. If you have a file and it's doubled in size assess the difference in the

execution time for both the sequential search and binary search

independently.

[2 marks]

d. Describe what is meant by the query optimization. Mentioning what is the main functionality of the optimizer. Including an example.
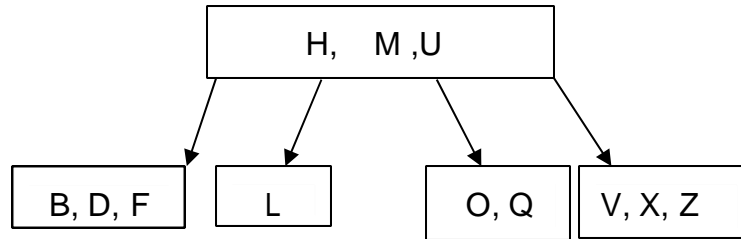
[6 marks]
[3 mark for definition, 3 for the query optimizer]

[Q2 Total: 20]

Q3. Answer the following:

a. Consider the following B-tree in which a node can contain three search key values and four children. Show the B-tree after inserting (G).

H,   M ,U

B, D, F   L   O, Q   V, X, Z

[10 marks]
[2 marks for each move]

b. Consider the following database schema:

R(A,B),   S(A,B,C),   T(B, D,E)

For the following questions, clearly indicate which relational algebra queries are equivalent:

First relational algebra
$Q1 = \sigma_{A=1,B>2}((R \bowtie S) \bowtie T)$
$Q2 = (\sigma_{A=1,B>2}(R \bowtie S)) \bowtie T$

Or this Second Relational
algebra $Q3 = \pi_E(\sigma_{D=1}(T \bowtie S))$
$Q4 = \pi_B(S) \bowtie \pi_{B,E}(\sigma_{D=1}(T))$

[10 marks]

[5 mark for each Relational Algebra]

[Q3 Total: 20]

Q4. What is the effect of the ROLLBACK command in a transaction? Clarify your answer by an example.   **[6 marks]**

Q5. Write the suitable terminology/solution of the following:

a. "Main memory buffer of log file must be written to disk before transaction commits"
b. "A transaction must lock all its items before starting execution".
c. Considering Recoverability, What is type of the following schedule?

T1	T2
R(X)	
W(X)	
R(Y)	
W(Y)	
Commit	
	R(X)
	W(X)
	Commit

d. What Concurrency control technique which is used to ensure both conflict serialzability and freedom from a deadlock.

e-What's the concurrency control problem, which is that represented by the following figure?
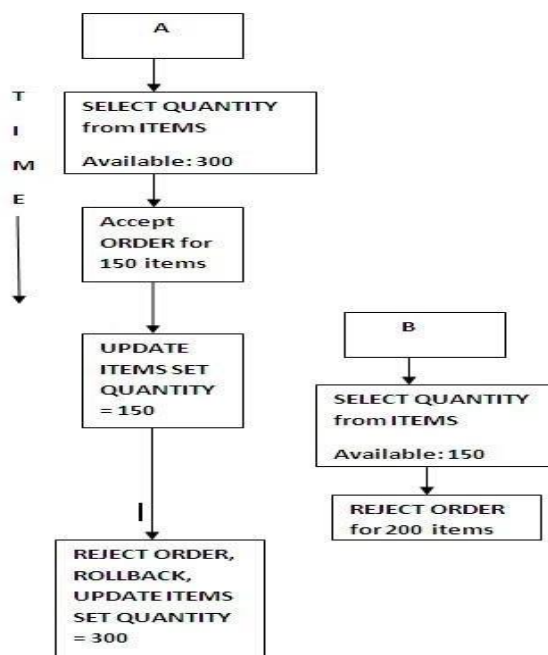
 f. As a bank audit transaction reads Mary's account balance, $100, Mary transfers $50 to her checking, making it $250. The audit transaction ended, Mary's account balance was $350. What is the problem in this situation?

[18marks]

[3 mark for each]

Q6. Answer the following

a- Answer the following and <u>justify your answer</u>

T1:R(A),   W(A), C
T2:   W(A), C
T3:   W(A), C

      i.Is this schedule Serializable?   **[2 Marks]**
      ii.Is this schedule Conflict Serializable**?**   **[2 Marks]**

b. Assume that Ti requests a lock held by Tj. The following table summarizes the actions taken for wait-die and wound-wait scheme:

	Wait – die scheme	Wound – wait scheme
Ti is younger than Tj	W	X
Ti is older than Tj	Y	Z

Assume that W,Y,X,and Z are the actions that must be taken by concurrency control protocol. Redraw the table and Fill in correct status values of Ti and Tj at W, Y, X, and Z respectively.**[12 Marks]**

c. How is privacy related to statistical database security? **[3 Marks]** What measures can be considered to ensure some degree of privacy in statistical databases? **[3 Marks]**

d. "Multimedia information systems are very complex and embrace a large set of issues". Discuss these issues.   **[4 Marks]**

      .   **[Q5 Total: 26 Marks]**

--End of Final Exam -------------------------------

**Module Specification – (Programme Specs Ver. 5)
2019/20**

Module Code:19CSIS05I	Title: Database II	
Level: 5	Modular weight:10	Faculty/Dept.: ICS
Pre-requisite modules: CSIS03C		
Reassessment: *No restrictions*		
Module Leader: Assoc. Prof. Doaa Elzanfaly		
Semester taught: One		
Date of latest revision: April 2017		

Aims

This module aims to give students in depth knowledge about database systems implementation techniques that covers: database storage management and tuning, database system architecture, indexing techniques, query processing and optimization, transaction processing concepts, concurrency control techniques, database recovery techniques, database security and authorization, enhanced data models for advanced applications, temporal databases, and emerging technologies and applications.

Intended Learning Outcomes

On completion of this module students should be able to:

Knowledge and Understanding

1. Identify the fundamental techniques and methods applied for data storage and retrievalincludinghashing,fileindexing,andqueryprocessingandoptimisation techniques.[A12]
2. Explains the concepts of transaction processing, concurrency control, and database recovery from failures, security against different threads and authentication and how these concepts are employed in modern database systems.[A4]
3. Apprise recent trends and advances in the area of data management systems. [A10]

Intellectual Skills

4. Evaluate different alternatives for query processing and optimization.[B5]
5. Examine database recovery mechanisms and discuss how they could be used to recover a database from various types of disasters. [B2],[B8]
6. Apprise issues related to database performance monitoring, tuning and reliability. [B2],[B11]

Practical and Professional skills

7. Report general database State, workload, and performance.[C10]
8. Organise the database administration tasks including security issues and recovery mechanisms.[C11]

General and Transferable skills

9. Develop an analytical approach for problem solving.[D9]
10. Apply critical reasoning to issues through independent thought and informed judgement.[D9]

Employability

This module will provide opportunities for students to:

1. Find information in different formats from a range of local or remote data sources.[B.3.2]
2. Generate imaginative ideas that can be applied to different situations.[C.2.1]
3. Make decisions by determining the best course of action and evaluating different options based on logic and fact in order to present solutions.[C.2.5]
4. Demonstrate determination to get things done and to constantly looking for better ways of doing things.[C.2.6]

Indicative Content
• Database file organisations: Heap, ordered, and hashed files of records.
• Retrieving Data from storage using different indexing techniques
• Query processing and optimization techniques.
• Database tuning and physical design issues.
• Database transaction processing.
• Protocols for concurrency control in database.
• Database recovery protocols.
• Database security and authentication.
• Emerging database technologies and applications.

Methods of Learning, Teaching and Assessment
Total student effort for the module: xx hours on average over one semester.

Type of session	Typical Student Effort		
	Typical number in the semester/s	Typical hours per week	Total hours
Lecture	12	2	24
Tutorial	-	-	-
Laboratory	12	2	24
Private study			52

Assessment Type	Weight %	ILOs Assessed	Exam Semester	Exam/ Written Coursework Length
Two In-lab tests	40%	4-10	2	30 min. each
One unseen written exam.	60%	1-6	2	120 minutes

Methods of Feedback

In response to assessed work:

- Each assignment is returned to the student with an individual written feedback on the accompanying feedback form.
- Generic exam feedback will be given on the e-learning system.

Developmental feedback generated through teaching activities:

- Dialogue between students and staff in workshops and Labs

Indicative Reading List

- Ramez Elmasri and Shamkant B. Navathe. Database Systems: Models, Languages, Design and Application Programming, 6th Edition, Pearson(2011)
- Connolly, T. and Begg, C., "Database Systems: a Practical Approach toDesign, Implementation and Management", 6th Edition, Addison-Wesley,(2015).