



University
of Windsor

Comp-3150 (60-315) Winter 2021

Final Examination PRACTICE

Examiner: Dr. C. I. Ezeife: Final To be Given: Wed. April 21, 2021 (08:30am)

Student Name: _____

Student Number: _____

INSTRUCTIONS (Please Read Carefully)

Examination Period is 2 hours 30 minutes **(online version time extended to 4 hours)**

Answer all questions. Write your answers in the spaces provided in the question paper. This is closed book and closed notes test. **You can type in your answers into the word file and submit, or print, write with hand, scan clearly into only a .pdf or .jpeg file and submit.**

Total Marks =50. Total number of sections = 2

Please read questions carefully! Misinterpreting a question intentionally or unintentionally results in getting a “ZERO” for that question. Good Luck!!!

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CONFIDENTIALITY AGREEMENT & STATEMENT OF HONESTY

I confirm that I will keep the content of this assignment/examination confidential.

I confirm that I have not received any unauthorized assistance in preparing for or doing examination. I confirm knowing that a mark of 0 may be assigned for copied work.

For Online Test/Examination in Comp 3150 Winter 2021: (additional rules to be observed):

- 1. I confirm that I agree to write this final examination as a closed book examination.**
- 2. I confirm that I am the student with the name and student id signed below.**
- 3. I confirm that I agree to not send email, chat, text or talk in any way to people other than the instructor or proctoring GA of this course during this examination.**
- 4. I confirm that I agree to not engage in copying or cheating during this online examination.**

Student Signature

Student Name (please print)

Student I.D. Number

Date

To write the Online Final examination, log on to Black board (BB) virtual class room at Exam time, and go to Resource page of the Black Board for Course, go to the Test Materials link to download the Course Comp 3150 Final Exam. You can do the test in one of these three ways:

1. Print it, write it with hand, scan clearly with camera saved only in a .pdf or .jpeg file and submit back through the assignment link before the end of test period.
2. Type in all your answers in the word file and submit.

3. Use a combination of methods 1 and 2 above.

Use of chat in BB is disallowed to reduce chances of cheating. Please, send mail to any of the GA or TAs or Professor Ezeife (cezeife@uwindsor.ca) if you have any questions. The GA/TA emails are given below:

For proctoring on Wed. April 21, 2021, arrive in the BB virtual class room at least 15 minutes before 08:30am. I will disable chat option for students to cut down on incidents of cheating. Students can raise hands when they have a question so that the proctoring GA in charge of the student can communicate with them through email only. GA/TA will be responsible for students during proctoring as follows:

GA/TA Names	Email	Student to Proctor (Last name begins with)
Pooja Chakrabarthi	chakrabp@uwindsor.ca	A to C
Salwa Mohamed	moham12y@uwindsor.ca	D to J
Mohammad Elias Khan	khan1ft@uwindsor.ca	K to O
Niyati Vyas	vyas8@uwindsor.ca	P to R
Nihar Patel	patel3j@uwindsor.ca	S to Z

For marking purposes only (This part not to be filled by students)

Question	Mark
Section A (30 marks for 15 multiple choice questions)	/30
Section B	
Que 1 (20 marks)	/20
Que 2 (15 marks)	/15
Que 3 (20 marks)	/20
Que 4 (15 marks)	/15
Total	/100

Section A

30 marks for 15 Multiple Choice Questions. Each question in this section is worth 2 marks.

R

key	A
1	a1
2	a2
3	a2
4	a3

S

key	A
1	a1
2	a2
3	a4
4	a5

Use relations R and S above to answer the next few questions

1. Are the relations R and S union compatible in SQL?

- A. YES
- B. NO
- C. NOT APPLICABLE
- D. DON'T KNOW
- E. None of the above

2. In SQL, the result of $R(A) \cup ALL S(A)$ is _____.

- A. a1, a1, a2, a2, a2, a3, a4, a5
- B. a1, a2, a3, a4, a5
- C. a1, a2
- D. a3
- E. None of the above

3. In SQL, the result of $R(A) \text{ EXCEPT } S(A)$ is _____.

- A. a1, a1, a2, a2, a2, a3, a4, a5
- B. a1, a2, a3, a4, a5
- C. a1, a2
- D. a3
- E. None of the above

4. With SQL, to present the values of $S(A)$ sorted in descending order, we use the query _

- A. Select * from S desc;
- B. Select A from S order by A desc ;
- C. Select A from S order by A asc;
- D. Select A order by A from S;
- E. None of the above

Given the following mini world where sailors reserve boats, use tables S1 and R1 to answer the next few questions.

Sailor S1

Sid	Sname	Rating	age
28	YUPPY	9	35
31	LUBBER	8	55
44	GUPPY	5	35
58	RUSTY	10	35

Reserves R1

Sid	Bid	day
22	101	10/10/2011
58	103	11/12/2011

5. What is retrieved by the following SQL query from S1, R1 database above?

SELECT s.age from S1 s where s.name LIKE 'Y_%Y';

- A. 28
- B. 35
- C. 55
- D. 58
- E. None of the above

6. What is retrieved by the following SQL query from S1, R1 database?

Select s.sname from S1 s where s.sid IN
(select R.sid from R1 R where R.bid=103);

- A. YUPPY
- B. LUBBER
- C. GUPPY
- D. RUSTY
- E. None of the above

7. The SQL query in question 6 above can also be expressed as ____ .
- Select s.sname from S1 s where EXISTS
(select * from R1 R where R.bid=103 AND s.sid = R.sid);
 - Select s.sname from S1 s, R1 R where
R.bid=103 AND s.sid = R.sid;
 - Select s.sname from S1 s where R.bid=103 AND s.sid = R.sid;
 - both A and B
 - None of the above
8. The result of the following relational algebra query on the S1 and R1 database above is:
Assume result is presented in correct tabular format with comma meaning start new line.
 $\pi_{\text{sname}} (\sigma_{\text{rating} > 8 \text{ and age} = 35}(\text{S1}))$
- YUPPY
 - LUBBER
 - GUPPY
 - YUPPY, RUSTY
 - none of the above
9. The relational algebra query for the SQL query “Select s.sname from S1 s, R1 R where R.bid=103 AND s.sid = R.sid;” is ____.
- $\pi_{\text{sname, rating}} (\sigma_{\text{rating} > 8 \text{ and age} = 35}(\text{S1}))$.
 - $\pi_{\text{rating}} (\sigma_{\text{rating} > 8 \text{ and age} = 35}(\text{S1}))$
 - $\pi_{\text{sname}} (\sigma_{\text{bid}=103}(\text{R1}))$
 - All of the above
 - None of the above
- 10 . A relational algebra query for getting sid in S1 who are also sid in R1 is _____.
- $\pi_{\text{S1.sid}} (\text{S1}) \cap \pi_{\text{R1.sid}} (\text{R1})$
 - $\pi_{\text{S1.sid}} (\text{S1}) \cup \pi_{\text{R1.sid}} (\text{R1})$.
 - $\pi_{\text{S1.sid}} (\text{S1}) - \pi_{\text{R1.sid}} (\text{R1})$.
 - All of the above.
 - None of the above
11. A correct tuple relational calculus query in the S1 and R1 database above is_____.
- {s.sname | R1(s)}
 - {r.sid | S1(r) and r.sid = 31}
 - {s.sname | EMPLOYEE(s)}.
 - All of the above.
 - None of the above.
12. Which of the following statements are true of indexes

- A. They are data files that can be stored on disk.
- B. Indexes have two fields as the index key and the disk block address.
- C. B-tree and B+tree indexes are multilevel indexes commonly used in RDBMS.
- D. All of the above
- E. None of the above

13 . With B+-tree Indexes, all data nodes are stored on the leaf nodes.

- A. YES**
- B. NO**
- C. NOT APPLICABLE**
- D. DON'T KNOW**
- E. None of the above**

14. A primary index _____:

- A. Has its index field the same as the ordered key field in the primary data file.
- B. Is the same as a secondary index.
- C. Has to be a single level index.
- D. All of the above
- E. None of the above

15. While inserting records in the database, possible integrity constraint violation is:

- A. Domain constraint.**
- B. Entity constraint.**
- C. Referential integrity constraint.**
- D. All of the above**
- E. None of the above**

Section B (70 marks):
This section has 4 questions :

Given the following six relations for an order-processing database application in a company:

CUSTOMER (Cust#, Cname, City)
 ORDER (Order#, Odate, Cust#, Ord_Amt)
 ORDER_ITEM (Order#, Item#, Qty)
 ITEM (Item#, Unit_price)
 SHIPMENT (Order#, Warehouse#, Ship_date)
 WAREHOUSE (Warehouse#, City)

Here, Ord_Amt refers to total dollar amount of an order; Odate is the date the order was placed; Ship_date is the date an order (or part of an order) is shipped from the warehouse. Assume that an order can be shipped from several warehouses.

Question 1: (total marks: 20 for 10 + 5 + 5)

- Design an ER model database representation for this order-processing database, clearly specifying entities and relationships, attributes, identifying their primary keys and candidate key attributes, and all constraints. (10 marks)
- Write all the SQL instructions to create all database tables with all constraints specified. (5 marks)
- Write a nested SQL query for an English query you posed on your database (5 marks)

Que. 1 (20 marks for all of a to c)

Sub question	Answers
a.. (10 marks)	a.
b.. (5 marks)	b.

c. (5 marks)	c.

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Question 2: (total marks = 15 for 5 + 5 + 5)

- Design a simple database with at least 5 relations for such applications as “students taking courses taught by faculty in class rooms at a specific time” (5 marks)
- Is the relation R in 3NF? Explain your answer using functional dependencies. (5 marks)
- If your R above is in 3NF, create at least one table from your database that is not in 3NF. If your R is not in 3NF, decompose R into 3NF relations. In each case, you are required to specify the primary keys and the functional dependencies that exist in each of the relations and thus, in the database with some discussions.(5 marks)

Que 2 (15 marks for all of a to c)

(a) (5 marks)	a.
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(b). (5 marks)	b.
(c) (5 marks)	c.

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Question 4 : (total marks = 15 for 7.5 + 7.5)

(a). Given the following unique id for some database records of a relation, construct the B-tree index structure of order $p=3$ (or with maximum of 3 pointers) for speeding up retrieval of these records from their primary data file stored on disk. The data to build index file for are: 8, 5, 1, 7, 3, 12, 9, 6, 2, 10

Show the steps through arriving at your final tree before giving your final tree.

(7.5 marks)

Solution (a) (7.5marks)

Final B-tree is given below:

Steps for Getting the final B-tree are given below:

(b). Using the same data set of 8, 5, 1, 7, 3, 12, 9, 6, 2, 10, construct a B+-tree index structure of order $p=3$ (or with 3 [pointers for internal nodes and 2 data entries for leaf nodes). Show the steps through arriving at your final tree before giving your final tree. (7.5 marks)

Solution (b) (7.5 marks)

Final B+-tree is given below:

Steps for Getting the final B+-tree are given below:

