Q1
1 Point

It is a violation of the Academic Integrity Code to look at any reference material other than your textbook and lecture notes, or to give inappropriate help to someone or to receive unauthorized aid by someone in person or electronically via messaging apps such as WhatsApp. Academic Integrity is expected of all students of Hacettepe University at all times, whether in the presence or absence of members of the faculty. Do NOT sign nor take this exam if you do not agree with the honor code.

Understanding this, I declare I shall not give, use or receive unauthorized aid in this examination.

Signature (Specify your name and surname as your signature)

YILDIRIM BAYAZIT AKYUREK

While answering the following questions, please consider the concepts that we discussed in our lectures unless stated otherwise.

Q2
18 Points

Consider the following employee database schema. Which of the following are the appropriate primary keys?

employee (person_name, street, city)
works (person_name, company_name, salary)
company (company_name, city)

- [ ] person_name, city
- [x] person_name
- [ ] company_name, city
- [x] company_name
- [ ] person_name, company_name, salary

Q3

32 Points

Assume you have relational schemas R(A,B), S(B,C), and T(C,D). Consider the three relational algebraic expressions given below.

I-) $\Pi_{A,D}(\sigma_{A<10}(T \bowtie (R \bowtie S)))$

II-) $\Pi_{A,D}(T \bowtie (\sigma_{A<10}(R) \bowtie S))$

III-) $\Pi_{A,D}\left(T \bowtie \Pi_{A,C}(\sigma_{A<10}(R) \bowtie S)\right)$

Q3.1

16 Points

Which of the expressions are equivalent?

- ○ I and II
- ○ I and III
- ○ II and III
- ◉ All Equivalent

Q3.2
16 Points

Assume that relations R, S, and T are huge relations, i.e., each contains thousands of records. Compare the algebraic expressions that you identified as equivalent, indicate which one might execute faster than the other(s) by giving its number (I, II, or III), and explain why.

You will only get points if justify your answer correctly.

Option 3 has extra project operations, it is unnecessary. Since the a<10 operation is done only in one place, so it is the most correct thing to do in the early. therefore 2 is faster.

Q4
18 Points

Consider the following bank database. Assume that branch IDs and customer IDs uniquely identify branches and customers, but loans and accounts can be associated with more than one customer.

branch(branch_ID, branch_city, assets)
customer (ID, customer_name, customer_street, customer_city)
loan (loan_number, branch_ID, amount)
borrower (ID, loan_number)
account (account_number, branch_ID, balance)
depositor (ID, account_number)

Which of the following is **not** an appropriate *foreign key*?

- ○ For loan: branch_ID referencing branch
- ○ For depositor: ID referencing customer
- ○ For account: branch_ID referencing branch

- [x] For borrower: ID referencing branch_ID

Q5

15 Points

..... is the logical design of the database and ..... is a snapshot of the data in the database at a given instant in time.

- [ ] Database instance, Relational schema
- [ ] Database relation, Entity-Relationship Diagram
- [ ] Database relation, Database domain
- [x] Relational schema, Database instance

Q6

16 Points

A money transfer operation from one account to another must be .....

Primary keys are .....

Having multiple copies of the same data may lead to .....

..... may sometimes help queries run faster.

- [ ] transactional, unique, consistency, redundancy
- [x] atomic, unique, inconsistency, availability
- [ ] atomic, minimal, inconsistency, redundancy
- [ ] unique, minimal, consistency, redundancy

Quiz 1

GRADED

STUDENT
YILDIRIM BAYAZIT AKYÜREK

TOTAL POINTS
84 / 100 pts

QUESTION 1
(no title) **1** / 1 pt

QUESTION 2
(no title) **18** / 18 pts

QUESTION 3
(no title) **32** / 32 pts

3.1 (no title) **16** / 16 pts

3.2 (no title) **16** / 16 pts

QUESTION 4
(no title) **18** / 18 pts

QUESTION 5
(no title) **15** / 15 pts

QUESTION 6
(no title) **0** / 16 pts