Course: CS204- **DATABASE SYSTEMS**   Time Allowed: *90 min.*
Max Points: *40*

Midterm 1

Section: _____   Name: _____   Roll No: _____

Question 1: *(15 points)*

Suppose each of the following update operations are applied directly to the database state shown above. Tell if the operation would be done successfully (i.e. acceptable) or not. Explain your answer briefly. Also state all the integrity constraints violated by each operation, if any.

STUDENT

RollNo	Name	Login	Age	Gpa
150	Tahree	tahreem@cs	18	3.3
155	Isbah	isbah@cs	19	3.1
160	Izaan	izaan@ee	17	2.6
165	Isbah	isbah@ee	19	3.6
170	Alia	alia@math	18	3.3

GRADE

RollNo	Course Code	Letter Grade
150	cs204	A
150	cs102	B
155	cs102	A
155	cs409	C

COURSE

Course	Title	CrHrs
cs102	CP	4
cs204	DB	4
cs409	DW	4

a) Insert <'cs502', 'ADB', NULL> into COURSE.

Accept ◯   **Reason:**
Reject ◯

b) Insert <165, 'cs304', A> into GRADE.

Accept ◯   **Reason:**
Reject ◯

c) Insert <180, 'Tahreem', 'tahreem@cs', 18, 3.3> into STUDENT.

Accept ◯   **Reason:**
Reject ◯

d) Insert <155, 'Raza', 'raza@cs', 25, 3.5> into STUDENT.

Accept ◯   **Reason:**
Reject ◯

e) Update the RollNo of the STUDENT tuple with age=18 to 170, if the applicable referential action is CASCADE.
Accept ◯   **Reason:**

Reject ◯

f) Update the CourseCode of the COURSE tuple with CourseCode='cs102' to 'cs302', if the applicable referential action is CASCADE.
Accept ◯   **Reason:**
Reject ◯

g) Update CourseCode of the GRADE tuple with LetterGrade='B' to NULL.

Accept ◯   **Reason:**
Reject ◯

h) Delete the COURSE tuple with CourseCode='cs409', if the applicable referential action is CASCADE.

Accept ◯   **Reason:**
Reject ◯

i) Delete the STUDENT tuple with RollNo=165, if the applicable referential action is RESTRICT.

Accept ◯   **Reason:**
Reject ◯

j) Delete the GRADE tuple with LetterGrade='A'.

Accept ◯   **Reason:**
Reject ◯

Question 2: *(5 points)*

Consider the following current state of the R relation.

R

A	B	C	D
a1	b1	c2	d1
a1	b2	c1	d1
a1	b3	c1	d2
a2	b4	c2	d1

Specify all possible keys (i.e. minimal superkeys) for this current state of relation. You may assume that no future instances of this relation will violate the keys that can be inferred to hold in the current state.

_____

Given the following relational state, show the result of each relational algebraic expression. Also show the result of intermediate relations.

T1   **T2**

A	**B**
1	4
2	4
3	4
1	5
2	5

B
3
4
5

a)   R1 ← π_A (T1)
      R2 ← π_B ((R1 **x** T2) - T1)
      R ← T2 – R2

b) RESULT(Bvalue, Frequency) ← B $\mathcal{F}_{COUNT(A)}$ (T1 * T2)

Question 4: *(5+5 = 10 points)*

_____

Consider the following relations for a database that keeps track of business trips of salespersons in a sales office (primary keys are underlined):

SALESPERSON (<u>CNIC</u>, Name, Start-Year, Dept-No)

TRIP (CNIC, From-City, To-City, Departure-Date, Return-Date, <u>Trip-ID</u>)

EXPENSE (<u>Trip-ID</u>, <u>Account#</u>, Amount)

Write the following queries **in relational algebra**:

a) Retrieve the name(s) of salesperson(s) who took trips to 'Karachi'.

b) Retrieve the name(s) of salesperson(s) who took no trip.