Last Name: _____   **First Name:** _____   **Student Id:** _____

Number: _____

Time allowed: *one hour 15 minutes.* Total score: 100 points. *Closed* book examination.

Answer all questions. Turn in both question and answer sheets (if needed).

Academic honesty policy will be followed strictly. Cheating will be pursued vigorously and will result in a failing grade of D or below, a permanent academic record, and possibly other more serious penalty.

(1) [25 points] The goal is to build a *highly simplified* toy prototype database to *partially support* the function of a Judo Club. Provide an ER diagram to capture and model the partial requirements below. You should list the entities, their attributes, and relationships (with roles or names, and cardinalities). Identify the primary keys and candidate keys of the entities when appropriate.

In the Judo Club's application, there are students and coaches. A student has a unique identifier, SId. For every student, a first name, a last name, an email address, and a phone are stored. A coach can serve many roles. A coach has a unique identifier, CoachId. For various reasons, a valid social security number (SSN) is needed. The name, email address, and phone of a coach is stored.

A student may be referred by another student member to join the club. If so, this reference information should be stored. A student may indicate other students as their preferred partners for training. Every student has a coach to serve as her main coach. Additionally, a student can have any number of coaches as her private coaches.

There are classes with classId as their unique class identifiers. A class must have a coach as its instructor. It may also have any number of coaches as assistants. A class has a title, level, start date, and end date. A student can enroll in any number of classes. The Judo Club should be able to record the grade and the number of attendances of a student enrolled in a class.

Please answer your question in the next page.

(1)   Your answer here:

(2)   [15 points] Consider the following ER diagram. Construct a reasonable set of relation schema to implement it. For each relation, underline the primary key (PK) and list its candidate keys (CK), foreign keys (FK), and all attributes you know *for sure* that are *nullable*. If you create a surrogate key for a relation, indicate so.
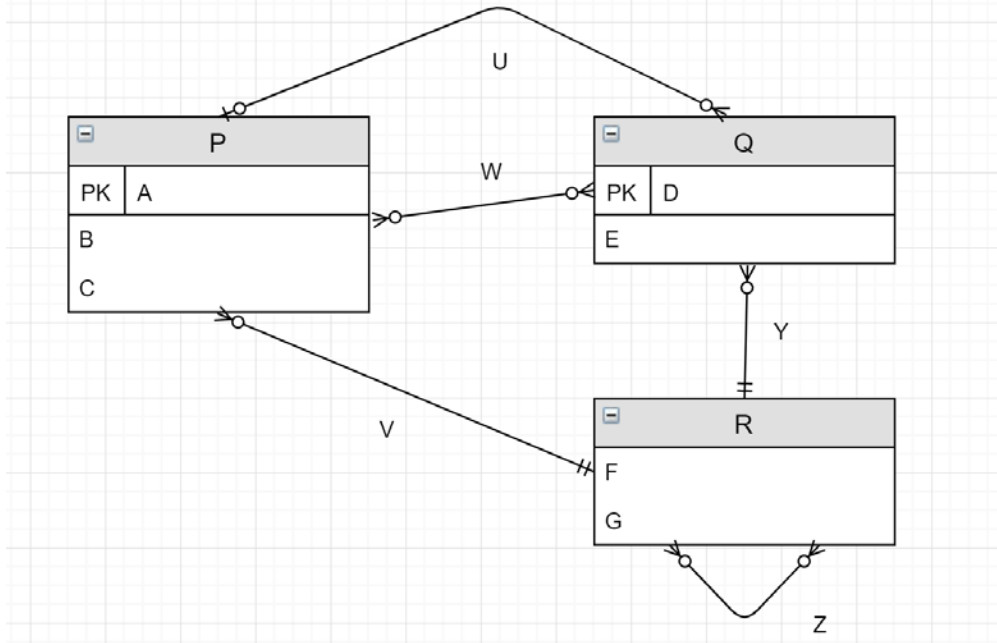
Answer: fill in the table below.

Relation		Relation	
[CK] [FK] [Nullable] [Note]		[CK] [FK] [Nullable] [Note]	
Relation		**Relation**	
[CK] [FK] [Nullable] [Note]		[CK] [FK] [Nullable] [Note]	
Relation		**Relation**	
[CK] [FK] [Nullable] [Note]		[CK] [FK] [Nullable] [Note]	

(3) [28 points] Use the Toy University (toyu) to answer the following queries with SQL. The detail of toyu is provided in a separate sheet.

(a) List the names of all faculty members of the school of 'CSE' in the following manner.

Result #1 (3×8)

fname	lname	deptCode
Daniel	Kim	CINF
Andrew	Byre	CINF
Paul	Smith	CSCI
Mary	Tran	CSCI
David	Love	CSCI
Sharon	Mannes	CSCI
Deborah	Gump	ITEC
Benjamin	Yu	ITEC

(b) List the names and advisor's facId of students majoring in CSCI but *not* minoring in ITEC in the following manner.

student (3×2)

fname	lname	advisor facID
Tony	Hawk	1,011
Mary	Hawk	1,011

(c) For every CSCI major student, list her name, the title of the courses enrolled, and the semesters, years and grades of these enrolled courses in the following manner.

Result #1 (6×11)

fname	lname	course	semester	year	grade
Tony	Hawk	Data Structures	Fall	2,019	A
Tony	Hawk	Design of Database Systems	Fall	2,019	A
Tony	Hawk	DBMS	Fall	2,019	B+
Tony	Hawk	Introduction to Information Systems	Fall	2,019	C
Tony	Hawk	Web Application Development	Fall	2,019	A-
Tony	Hawk	Design of Database Systems	Spring	2,020	D
Mary	Hawk	Data Structures	Fall	2,019	(NULL)
Mary	Hawk	Design of Database Systems	Fall	2,019	A-
David	Hawk	Data Structures	Fall	2,019	B-
David	Hawk	DBMS	Fall	2,019	B+
David	Hawk	Introduction to Information Systems	Fall	2,019	D

(d) List the names, minoring departments, and school names of the minor department of all students. Only list those students with a declared minor.

Result #1 (4×8)

fname	lname	minor department	minor school
Linda	Johnson	English	Human Sciences and Humanities
Bill	Ching	English	Human Sciences and Humanities
Tony	Hawk	Computer Information Systems	Science and Engineering
Mary	Hawk	Computer Information Systems	Science and Engineering
Catherine	Lim	Computer Information Systems	Science and Engineering
Linda	King	Computer Science	Science and Engineering
David	Hawk	Information Technology	Science and Engineering
Lillian	Johnson	Information Technology	Science and Engineering

(4) [22 points]

(a) [T or F] In the query design view of MS Access, users can select columns of participating tables to be displayed in the results.

(b) [T or F] In MS Access, the display name of a result column is always the same as the name of the column selected as the result.

(c) [T or F] Comparing to a file processing system, a DBMS provides a higher abstraction model for development.

(d) [T or F] In SQL, the SELECT statement is provided by its Data Definition Language.

(e) [T or F] A foreign key K of a relation R is also a candidate key of R.

(f) [T or F] The relational model is an object-oriented model.

(g) [T or F] In the relational model, a table may have no candidate key.

(h) [T or F] In an ER diagram, two entity types should not have the same name.

(i) [T or F] MS Access does not use SQL.

(j) [T or F] It is possible that the same attribute A to be the primary key of two relations, R1 and R2.

(k) [T or F] A primary key cannot have a null value.

[5] (10 points) Short Questions.

(a) The relation R(A,B,C) has five rows. How many distinct values of A may R have?

(b) The relation R(A,B,C,D,E) has one and only one candidate key: AB. List all superkeys.

(c) Write the SQL statement corresponding to the query design in Access below.

Field:	lname	fname	major department: deptName	credits	
Table:	student	student	department	student	
Sort:					
Show:	☑	☑	☑	☐	☐
Criteria:				>30	
or:					