King Saud University
College of Computer & information Sciences
Computer Science Department

CSC380: Introduction to Database Concept	Instructor: Dr. Kamal Haouam
Exam: MidTerm Exam	Date: Monday 09/11/2020

Question 1: (5 Marks)

Multiple-Choice Questions:

1) The relational model represents the database as a collection of _____.
a) files b) relations c) applications d) systems

2) In formal relational model terminology, a row is called _____.
a) tuple b) attribute c) relation d) domain

3)When there is more than one key in a relation, then each such key is called _____.
a) primary b) useful c) multiple d) candidate

4) _____ constraint states that no primary key value can be null.
a) key b) domain c) referential-integrity d) entity-integrity

5) _____ constraint is used to maintain consistency among tuples in two relations.
a) key b) domain c) referential-integrity d) entity-integrity

6) Many airline reservation and telephone directory systems that support large number of concurrent transactions with little delay are categorized as _____.
a) OLTP b) RTS c) AI d) OFTP

7) The ability to modify the data structure and not have to change the programs using that data is called: _____
a) data dictionary b) data independence c) data integrity d) referential integrity

8) _____ stores information about schemes, constraints, design decisions, usage standards and user information.
a) data bank b) repository c) depository d) tables

9) _____ language is used to do insertion, deletion, retrieval, and modification of data.
a) VDL b) SDL c) DDL d) DML

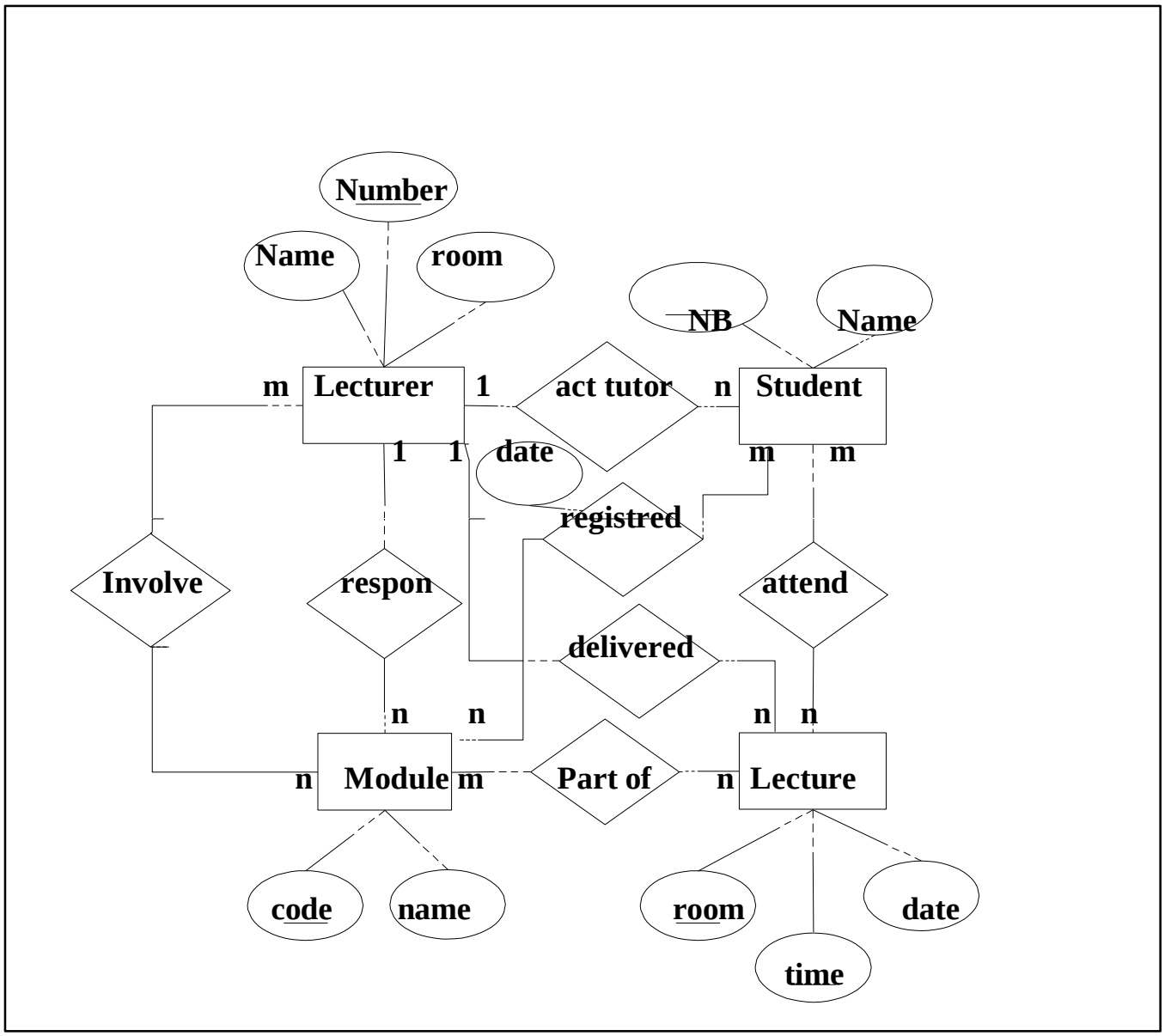
10) The description of a database is called database _____.
a) schema b) structure c) construct d) implementation

TRUE or FALSE:

1. Each row in a table represents a collection of different data values. (True / F)
2. It is possible for several attributes to have same domain. (True / F)
3. Tuples in a relation must have a particular order. (T / False)
4. Ordering of values in a tuple is important. (True / F)
5. Composite or multivalued attributes are allowed in relational model. (T / False)
6. A superkey can have redundant attributes. (True / F)
7. A foreign key can have a null value. (True / F)
8. A foreign key can refer to its own relation. (True / F)
9. Insert operation cannot violate domain constraint. (T / False)
10. Delete operation can violate all constraints. (T / False)

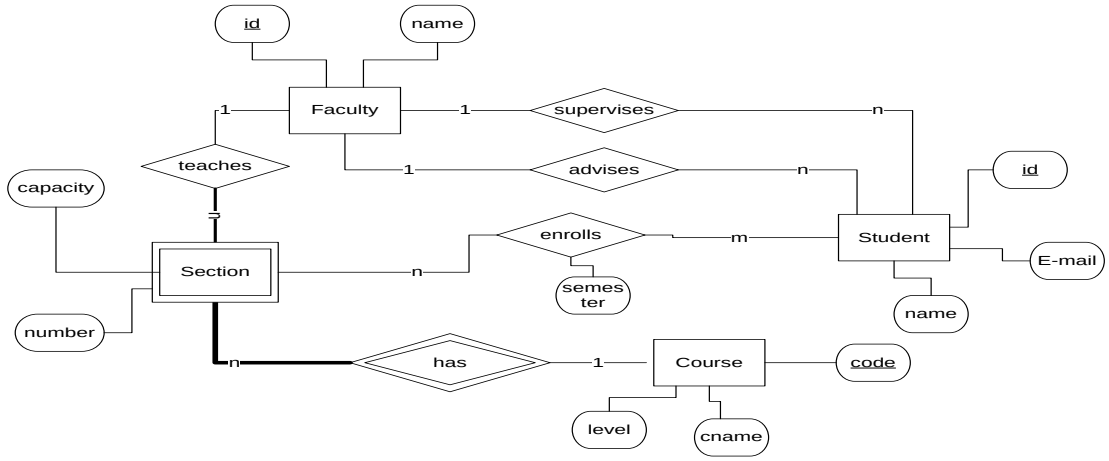
Question 2: (8 Marks)

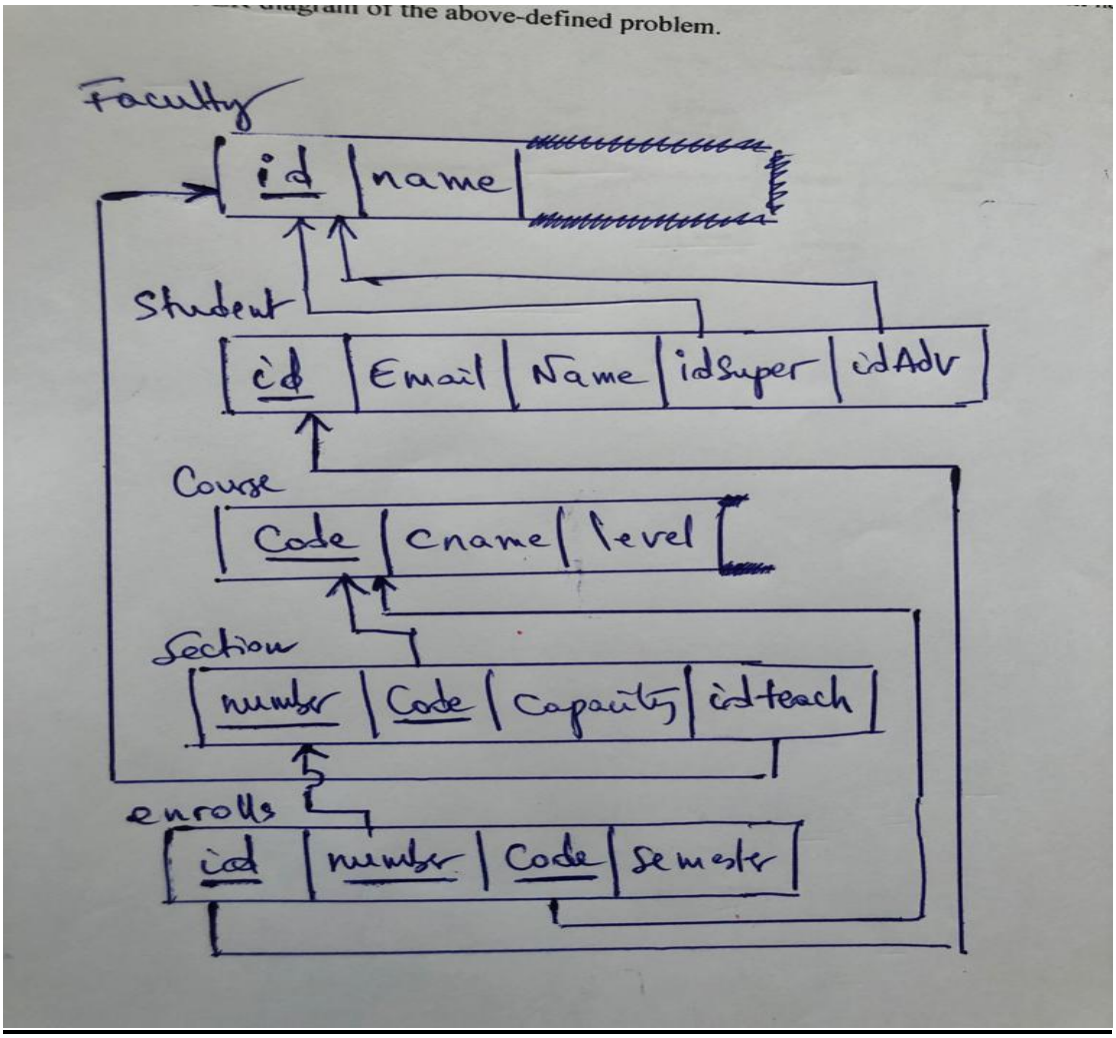
A lecturer, identified by his number, name ad room number, is responsible for organizing a number of course modules. Each module has a unique code and also a name and each module can involve a number of lecturers who deliver part of it. A module is composed of a series of lectures and because of economic constraints and common sense sometimes lectures on a given topic can be part of more than one module. A lecture has a time, room and date and is delivered by a lecturer and a lecturer may deliver more than one lecture.
Students, identified by number and name, can attend lectures and a student must be registered for a number of modules. We also store the date on which the student first registered for that module. Finally, a lecturer acts as a tutor for a number of students and each student has only one tutor.
Give the ER diagram of the above-defined problem.



Question 3: (7 Marks)

Map the following ER diagram into a relational database schema. Specify all necessary constraints





Question 4: (5 Marks)

These operations can violate the schema based constraints. Answer by operation acceptable or not. If not which constraint is violated ?

1. Insert <'Cecilia', 'F', 'Kolonsky', '677678989', '1960-04-05', '6537 Windy Lane, Katy, TX', Z, 28000, null, 4> into EMPLOYEE.
2. Insert <'Alicia', 'J', 'Zelaya', '99988777', '1960-04-05', '6537 Windy Lane, Katy, TX', F, 28000, '987654321', 4> into EMPLOYEE.
3. Insert <'Cecilia', 'F', 'Kolonsky', null, '1960-04-05', '6537 Windy Lane, Katy, TX', F, 28000, null, 4> into EMPLOYEE.
4. Insert <'Cecilia', 'F', 'Kolonsky', '677678989', '1960-04-05', '6537 Windswept, Katy, TX', F, 28000, '987654321', 7> into EMPLOYEE.
5. Insert <'Cecilia', 'F', 'Kolonsky', '677678989', '1960-04-05', '6537 Windy Lane, Katy, TX', F, 28000, null, 4> into EMPLOYEE.
6. Delete the WORKS_ON tuple with ESSN = '999887777' and PNO = 10.
7. Delete the EMPLOYEE tuple with SSN = '999887777'.
8. Delete the EMPLOYEE tuple with SSN = '333445555'.
9. Update the SALARY of the EMPLOYEE tuple with SSN = '999887777' to 28000.
10. Update the DNO of the EMPLOYEE tuple with SSN = '999887777' to 1.

Solution:

1. Insert <'Cecilia', 'F', 'Kolonsky', '677678989', '1960-04-05', '6537 Windy Lane, Katy, TX', Z, 28000, null, 4> into EMPLOYEE.
   - This insertion violates the domain constraint for gender (7^{th} attribute) since Z is not a valid entry for Gender.
2. Insert <'Alicia', 'J', 'Zelaya', '99988777', '1960-04-05', '6537 Windy Lane, Katy, TX', F, 28000, '987654321', 4> into EMPLOYEE.
   - This insertion violates the key constraint because another tuple with the same SSN value ('999887777') already exists in the EMPLOYEE relation, and so it is rejected.
3. Insert <'Cecilia', 'F', 'Kolonsky', null, '1960-04-05', '6537 Windy Lane, Katy, TX', F, 28000, null, 4> into EMPLOYEE. The SQL equivalent of this statement would be: INSERT INTO STUDENTS VALUES ('Cecilia', 'F', 'Kolonsky', null, '1960-04-05', '6537 Windy Lane, Katy, TX', F, 28000, null, 4).
   - This insertion violates the entity integrity constraint (null for the primary key SSN in the 4^{th} position), so it is rejected.
4. Insert <'Cecilia', 'F', 'Kolonsky', '677678989', '1960-04-05', '6537 Windswept, Katy, TX', F, 28000, '987654321', 7> into EMPLOYEE.
   - This insertion violates the referential integrity constraint specified on DNO because no DEPARTMENT tuple exists with DNUMBER = 7 (the last attribute).
5. Insert <'Cecilia', 'F', 'Kolonsky', '677678989', '1960-04-05', '6537 Windy Lane, Katy, TX', F, 28000, null, 4> into EMPLOYEE.
   - This insertion satisfies all constraints, so it is acceptable.
6. Delete the WORKS_ON tuple with ESSN = '999887777' and PNO = 10.

- This deletion is acceptable.

7. Delete the EMPLOYEE tuple with SSN = ‘999887777’.
   - This deletion is not acceptable, because tuples in WORKS_ON refer to this tuple. Hence, if the tuple is deleted, referential integrity violations will result.
8. Delete the EMPLOYEE tuple with SSN = ‘333445555’.
   - This deletion will result in even worse referential integrity violations, because the tuple involved is referenced by tuples from the EMPLOYEE, DEPARTMENT, WORKS_ON, and DEPENDENT relations.
9. Update the SALARY of the EMPLOYEE tuple with SSN = ‘999887777’ to 28000.
   - Acceptable.
10. Update the DNO of the EMPLOYEE tuple with SSN = ‘999887777’ to 1.
    - Acceptable.

EMPLOYEE	FNAME	MINIT	LNAME	SSN	BDATE	ADDRESS	SEX	SALARY	SUPERSSN	DNO
	John	B	Smith	123456789	1965-01-09	731 Fondren, Houston, TX	M	30000	333445555	5
	Franklin	T	Wong	333445555	1955-12-08	638 Voss, Houston, TX	M	40000	888665555	5
	Alicia	J	Zelaya	999887777	1968-07-19	3321 Castle, Spring, TX	F	25000	987654321	4
	Jennifer	S	Wallace	987654321	1941-06-20	291 Berry, Bellaire, TX	F	43000	888665555	4
	Ramesh	K	Narayan	666884444	1962-09-15	975 Fire Oak, Humble, TX	M	38000	333445555	5
	Joyce	A	English	453453453	1972-07-31	5631 Rice, Houston, TX	F	25000	333445555	5
	Ahmad	V	Jabbar	987987987	1969-03-29	980 Dallas, Houston, TX	M	25000	987654321	4
	James	E	Borg	888665555	1937-11-10	450 Stone, Houston, TX	M	55000	null	1

DEPT_LOCATIONS	DNUMBER	DLOCATION
	1	Houston
	4	Stafford
	5	Bellaire
	5	Sugarland
	5	Houston

DEPARTMENT	DNAME	DNUMBER	MGRSSN	MGRSTARTDATE
	Research	5	333445555	1988-05-22
	Administration	4	987654321	1995-01-01
	Headquarters	1	888665555	1981-06-19

WORKS_ON	ESSN	PNO	HOURS
	123456789	1	32.5
	123456789	2	7.5
	666884444	3	40.0
	453453453	1	20.0
	453453453	2	20.0
	333445555	2	10.0
	333445555	3	10.0
	333445555	10	10.0
	333445555	20	10.0
	999887777	30	30.0
	999887777	10	10.0
	987987987	10	35.0
	987987987	30	5.0
	987654321	30	20.0
	987654321	20	15.0
	888665555	20	null

PROJECT	PNAME	PNUMBER	PLOCATION	DNUM
	ProductX	1	Bellaire	5
	ProductY	2	Sugarland	5
	ProductZ	3	Houston	5
	Computerization	10	Stafford	4
	Reorganization	20	Houston	1
	Newbenefits	30	Stafford	4

DEPENDENT	ESSN	DEPENDENT_NAME	SEX	BDATE	RELATIONSHIP
	333445555	Alice	F	1986-04-05	DAUGHTER
	333445555	Theodore	M	1983-10-25	SON
	333445555	Joy	F	1958-05-03	SPOUSE
	987654321	Abner	M	1942-02-28	SPOUSE
	123456789	Michael	M	1988-01-04	SON
	123456789	Alice	F	1988-12-30	DAUGHTER
	123456789	Elizabeth	F	1967-05-05	SPOUSE