Information and Computer Science Department
ICS 324 –Database Systems
Fall 171
Midterm Exam
Tuesday, November 7, 2017
Time: 100 minutes

Name:

ID#:

Section#:

Question #	Max Score	Score
1	10	
2	12	
3	18	
4	20	
5	20	
6	20	
Total	100	

Question # 1 [10 points]

Match each definition in the second table with its corresponding term in the first table.

Terms		
1. Degree	2. Logical data independence	3. Conceptual schema
4. Database	5. Data model	6. External schema
7. DBMS	8. Physical data independence	9. Database schema
10. Cardinality	11. Metadata	12. Database state

Definition	Term
The capacity to change the internal schema without having to change the conceptual schema.	
Changes when we insert or update or delete data from a database.	
The capacity to change the conceptual schema without having to change the external schemas and their associated application programs.	
a group of related objects in a database. Includes descriptions of the database structure, data types, and the constraints on the database	
is a software package that enables user to create and maintain databases	
is a set of concepts to describe database structure, operations, and constraints	
Number of columns in a table	
The information such as the structure of each file, the type and storage format of each data item, and various constraints on the data that is stored in the system catalog	
Number of rows in a table	
Describes part of the database that a particular user group is interested in	

Question # 2 [12 points]

The following table matches database constraints and database operations. Tick each cell where a constraint can be violated by the corresponding operation.

	INSERT	DELETE	UPDATE
Referential integrity			
Entity integrity			
Key constraint			
Domain constraint			

Question # 3 [18 points]

Answer the following questions using the relational schema below.

COURSE (COURSE_NO, COURSE_NAME)
STUDENT (STUDENT_ID, LNAME, FNAME, MAJOR)
FACULTY (FACULTY_ID, LNAME, FNAME, DEPARTMENT)
TAKEN_BY (STUDENT_ID, COURSE_NO, GRADE)
TAUGHT_BY (FACULTY_ID, COURSE_NO, SEMSTER, YEAR)

a. Can more than one student take a specific course? Why or why not?

b. Can a faculty member teach more than one course? Why or why not?

c. Can a student have more than one grade for the same course? Why or why not?

Question # 4 [20 points]

Assume that the schema has entity types **AA**, **BB**, and **CC**

Entity Type	Type of Entity	Attribute	Attribute type
AA	Strong	A1	key
		A2	Single valued
		A3	derived
BB	Strong	B1	key
		B2	Complex, consists of B3 and B4
		B3	Single valued
		B4	Multi valued
CC	weak	C1	Partial key
		C2	Single valued

The relationships are:

- An entity of type **AA** has 0 or more dependent entities of type **CC** (weak).
- An entity of type **AA** owns at least one entity of type **BB**, but each entity of type **BB** is owned by one entity type of **AA**.

Draw the ER diagram of the above schema.

Question # 5 [20 points]

Use the following table to answer the following question:

Entity Type	Attribute	Attribute type
XX	X1	key
	X2	Single valued
	X3	Single valued
YY	Y1	Single valued
ZZ	Z1	Single valued

Draw the EER diagram of each of the following.

a. **XX** is a superclass of **YY** and **ZZ** and its relationship with them is complete and overlapping

b. **XX** is a superclass of **YY** and **ZZ** and its relationship with them is partial and disjoint

Question # 6 [20 points]

Consider an entity type SECTION in a UNIVERSITY database, which describes the section offerings of courses. The attributes of SECTION are Section_number, Semester, Year, Course_number, Instructor, Room_no (where section is taught), Building (where section is taught), Weekdays (domain is the possible combinations of weekdays in which a section can be offered {'UTR', 'MW' and so on}), and Hours (domain is the possible time periods during which sections are offered {'0700-0750', '0800-0850', …., '1400-1640' and so on}). Assume that Section_number is unique for each course within a particular semester/year combination (that is, if a course if offered multiple times during a particular semester, its section offerings are numbered 1, 2, 3, and so on.). There are several composite keys for SECTION, and some attributes are components of more than one key. Identify two composite keys.