	King Saud University College of Computer and Information Sciences Department of Information Systems **Introduction to Database Systems (IS230) (3-0-1)** **Second Semester 1439/1440 (Spring 2019)**	
	First Midterm Exam - February 28, 2019	
	Total Points : 150 Points	
Student Name	**(Last, Middle, First)**	
	Student ID Number:	

Student Outcomes (SOs) Covered by Course

Outcome	Student Outcome Description	Coverage
(B)	An ability to analyze a problem, and identify and define the computing requirements appropriate to its solution	√
(C)	An ability to design, implement, and evaluate a computer-based system, process, component, or program to meet desired needs	√
(G)	An ability to analyze the local and global impact of computing on individuals, organizations, and society	√
(I)	An ability to use current techniques, skills, and tools necessary for computing practice.	√

Course Learning Outcomes (CLOs) vs. Student Outcomes (SOs)

#	Course Learning Outcomes	Student Outcomes			
		B	C	G	I
1	Understand the basic concepts of database systems			x	
2	Design a database with the Entity-Relationship model	x			
3	Design the Database Schema of a database		x		
4	Use professionally Structured Query Language (SQL)				x

For Instructor Use						
Question	**Q1**	**Q2**	**Q3**	**Q4**	**Q5**	**Total**
CLO covered	**1**	**1**	**2**	**3**	**3**	
SO covered	**G**	**G**	**C**	**B**	**I**	
Points	**10**	**20**	**30**	**40**	**50**	**150**
Score						

Q1) (SO-G) (10 Points) Answer All True and False (T/F) Questions

Q1) Schema construct is an illustrative display of most aspects of a database schema.	
a) True	b) False

Q2) The database state changes every time the database is updated.	
a) True	b) False

Q3) Physical Data Independence is the capacity to change the conceptual schema without having to change the external schemas and their associated application programs.	
a) True	b) False

Q4) System catalog consists of data about data and it implements the self-describing nature of the database approach.	
a) True	b) False

Q5) Traditional file system is sufficient if access to data by multiple users is not required.	
a) True	b) False

Q6) Nonprocedural DML can be used on its own to specify complex database operations.	
a) True	b) False

Q7) One of the advantages of database approach over traditional file system approach is restricting unauthorized access to data.	
a) True	b) False

Q8) External schemas describe the structure and constraints for the whole database for a community of users.	
a) True	b) False

Q9) Entity-relationship model is an example of conceptual data model.	
a) True	b) False

Q10) A database is a logically incoherent collection of data with some inherent meaning.	
a) True	b) False

Q2) (SO-G) (20 Points) Answer All Multiple Choice Questions (MCQ) :

Q1) …… is a software within the DBMS guarantees that each transaction is correctly executed or aborted.
A) Recovery subsystem
B) Online Transaction Processing
C) Concurrency control
D) All the above

Q2) …… access database occasionally when needed, typically middle- or high-level managers.
A) Naïve users
B) Casual users
C) Database administrators
D) Sophisticated users

Q3) …… specify some restrictions on valid data.
A) Structures
B) Operations
C) Constraints
D) Schema

Q4) …… Refers to the content of a database at a moment in time.
A) Extension
B) Database Schema
C) Valid state
D) Initial state

Q5) A Week entity is identified by the combination of ……of the weak entity type and the primary key of its identifying entity.
A) An Alternate Key
B) A Composite Key
C) A Partial Key
D) A Primary Key

Q6)…… specifies the minimum number of relationship instances that an entity can participate.
A) Cardinality ratio
B) Existence Dependency Constraint/ Participation Constraint
C) Domain
D) Range

Q7)…… stated that the primary key attributes of each relation schema cannot have null value.
A) Entity Integrity constraint
B) Referential integrity constraint
C) Domain constraint
D) Key constraint

Q8) DELETE operation may violate……
A) Entity Integrity constraint
B) Referential integrity constraint
C) Key constraint
D) All the above

Q9) …….. refers to the suppression of details of data organization and storage, and the highlighting of the essential features for an improved understanding of data.
A) Data Independence
B) Self data describing
C) Data Abstraction
D) All the above

Q10) …….. A relationship type between the same participating entity type in distinct roles
A) Recursive Relationship
B) Identifying Relationship
C) Week Entity Relationship
D) All the above

Q3) **(SO-C)** (30 Points) Consider a library relational database state as shown in figure below

BOOKS

Book_Id	Title	Publisher_Name
787822	Physics	TarcherPerigee
542312	Chemistry	Math Essentials
438727	Linear Algebra	iUniverse, Inc.
542223	Geometry	Dover Publications

AUTHORS

Author_ID	Author_Name
543522	Boris A. Kordemsky
909088	Ivan Savov
424235	Barbara Oakley
565543	Richard W. Fisher

BOOK_AUTHORS

Book_ID	Author_ID
542312	424235
438727	543522
438727	909088
542223	543522

PUBLISHER

Name	Address	Phone
TarcherPerigee	731 Fondren, Houston, TX	318-202-3412
Dover Publications	638 Voss, Houston, TX	337-921-2052
Math Essentials	3321 Castle, Spring, TX	216-121-4332
iUniverse, Inc.	291 Berry, Bellaire, TX	414-201-2209
Three Rivers Press	2313 Oak Tree St., LA	336-234-4242

BOOK_COPIES

Book_ID	Branch_ID	No_of_Copies
542312	82641	5
438727	29465	12
438727	42424	2
542223	37026	24

LIBRARY_BRANCH

Branch_ID	Branch_Name	Address
42424	Houston Library	975 Fire Oak, Humble, TX
37026	Dallas Library	5631 Rice, Houston, TX
82641	Austin Library	980 Dallas, Houston, TX
29465	Fort Worth Library	450 Stone, Houston, TX

BORROWER

Borrower_ID	Name	Address	Phone
202013	Abdulrahman	212 Dolphin, Houston, TX	214-424-2030
344867	Sultan	6446 Main, Fort Worth, TX	972-527-5322
577733	Abdullah	675 Mayfield Austin, TX	832-565-9231
065688	Hassan	7664 Euclid, Houston, TX	512-754-6361
764722	Jawad	4462 Mary, Dallas, TX	972-655-2350
977891	Ahmed	5432 Pinhock, Spring, TX	817-353-3682

BOOK_LOANS

Book_ID	Branch_ID	Borrower_ID	Date_Out	Due_DATE
542312	82641	202013	20/3/2016	10/4/2016
438727	42424	065688	25/3/2016	5/4/2016
438727	29465	764722	28/3/2016	8/4/2016
542312	82641	344867	1/4/2016	21/4/2016
542312	82641	577733	2/4/2014	22/4/2016
438727	42424	202013	30/3/2016	20/4/2016

Suppose that each of the following operations is applied directly to the database state shown above. Which of these operations violate any of the integrity constraints?

1. Insert <‘82641‘, ‘Spring Library’, ‘452 Spring, Houston, TX’> into LIBRAY_ BRANCH

Accepted (Yes / No)? if (No), why? ***NO***

Key Constraint Violation. Branch_ID = 182641 exists already.

2. Modify the Borrower_ID attribute of the BOOK_LOANS tuple with Book_ID =‘542312’ to ‘764722’

Accepted (Yes / No)? if (No), why? ***No***

Key Constraint Violation.

3. Delete the PUBLISHER tuple with Publisher_Name = ‘Dover Publications’

Accepted (Yes / No)? if (No), why? ***NO***

Referential Integrity Constraint violation. Publisher_Name = ‘Dover Publications’issn used as Foreign Key for Book table.

4. Insert <‘82642‘, ‘Lafayette Library’, ‘543 St. Mary, Lafayette, LA’> into LIBRAY_ BRANCH

Accepted (Yes / No)? if (No), why? ***YES*** - No Violation

5. Delete the PUBLISHER tuple with Publisher_Name = ‘Three Rivers Press’

Accepted (Yes / No)? if (No), why? ***YES***

No Violation

6. Modify the Auther_Name attribute of the AUTHORS tuple with Auther_ID =‘542312’ to ‘Boris A. Kodremsky’

Accepted (Yes / No)? if (No), why? ***NO***

There is no Auther_ID =‘542312’ is used.

7. Insert <‘542312‘, ‘37026, ‘362883’, ‘27/3/2016’, \17/4/2016> into BOOK_LOANS

Accepted (Yes / No)? if (No), why? ***NO***

Referential Integrity Constraint violation. BrowerID is not exist.

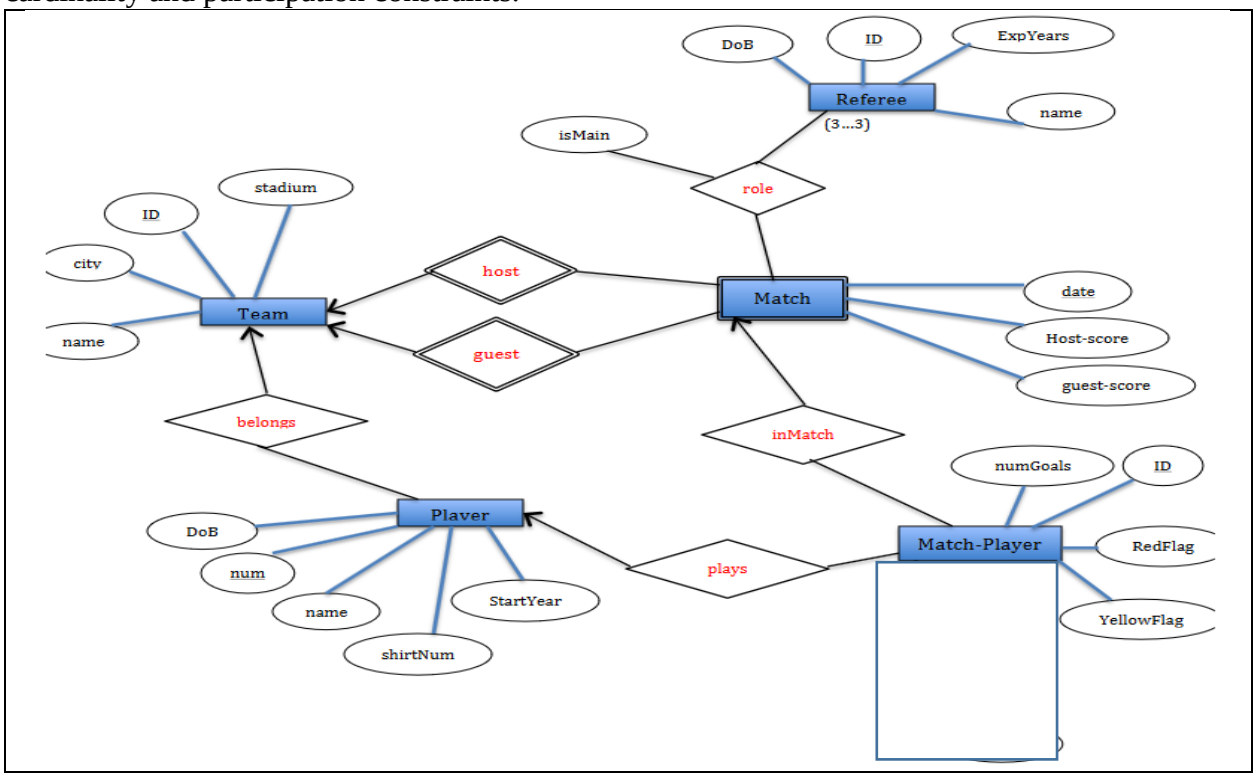
8. Insert <‘438727‘, ‘37026, ‘764722’, ‘27/3/2016’, \17/4/2016> into BOOK_LOANS

Accepted (Yes / No)? if (No), why? YES - No Violation

Q4) **(SO-B)** (40 Points) Assume we have the following application that models football teams, the games they play, and the players in each team. In the design, we want to capture the following:

- We have a set of teams, each team has an ID (unique identifier), name, main stadium, and to which city this team belongs.
- Each team has many players, and each player belongs to one team. Each player has a number (unique identifier), name, DoB, start year, and shirt number that he uses.
- Teams play matches, in each match there is a host team and a guest team. The match takes place in the stadium of the host team.
- For each match we need to keep track of the following:
    - The date on which the game is played
    - The final result of the match
    - The players participated in the match. For each player, how many goals he scored, whether or not he took yellow card, and whether or not he took red card.
    - ~~o~~ During the match, one player may substitute another player. ~~We want to capture this substitution and the time at which it took place.~~
- Each match has referees. For each referee we have an ID (unique identifier), name, DoB, years of experience. One referee is the main referee and the other two are assistant referee.

Draw an E-R diagram for the football database. Specify in the diagram the primary keys, the cardinality and participation constraints.



Q5) **(SO-I)** (50 Points) Consider the following database schema for a LIBRARY database, primary keys are underlined.

BOOK (Book_id, Title, Publisher_name)
BOOK_AUTHORS (Book_id, Author_name)
PUBLISHER (Name, Address, Phone)
BOOK_COPIES (Book_id, Branch_id, No_of_copies)
BOOK_LOANS (Book_id, Branch_id, Card_no, Date_out, Due_date)
LIBRARY_BRANCH (Branch_id, Branch_name, Address)
BORROWER (Card_no, Name, Address, Phone)

Write an SQL statement for the following queries:

1. **(8 Points) Write the create table statement of the table BOOK_LOANS, specify the primary key, foreign keys and any constraint.**

```
CREATE TABLE BOOK_LOANS  (
Book_id            Char(15)   NOT NULL,
Branch_id          Char(9)   NOT NULL,
Card_no            Char(20)   NOT NULL,
Date_out            Date      NOT NULL,
Due_date            Date    NOT NULL,
PRIMARY KEY (Book_id, Branch_id, Card_no) ,
FOREIGN KEY (Book_id) REFERENCES BOOK (Book_id)
FOREIGN KEY (Branch_id) REFERENCES LIBRARY_BRANCH
(Branch_id),
FOREIGN KEY (Card_no) REFERENCES C BORROWER (Card_no);
```

2. **(7 Points) For every book which due date on "15/3/2019", list the book_id, book title and the publisher phone number.**

```
SELECT BL.Book_id, B.Title, P.Phone
FROM   BOOK_LOANS BL, BOOK B, PUBLISHER P
WHERE BL.book_id= B.book_id and B.Publisher name= P.Name and
BL.due_date= "15/3/2019";
```

3. **(7 Points) Find the names of authors whose name begins with 'D' and has at least 2 characters.**

```
SELECT A.Author_Name
FROM Book_Author A
WHERE A.Author_name LIKE 'D_ %';
```

4. **(7 Points) Remove all the library branches located in "55 Olya street, Riyadh"**

```
DELETE FROM Library_Branch
WHERE Address=  “55 Olya street, Riyadh”
```

5. **(7 Points) Change the phone number of the borrower with card number “202” to “0502349245”**

```
UPDATE        Borrower
        SET          Phone = '0502349245'
        WHERE      card_number=202;
```

6. **(7 Points) Make a list of all people in the database whose names contains “Omar” either as an author or as a borrower and eliminate duplicated names.**

```
SELECT Author_name
FROM Book_Author
WHERE Author_name LIKE ‘%Omar%’
UNION
SELECT name
 FROM Borrower
WHERE name LIKE ‘%Omar%’;
```

7. **(7 Points) Delete all BORROWER whom lives in Jeddah and their names include “moh”.**

```
DELETE FROM BORROWER
WHERE Address Like  “%Jeddah%” AND Name Like “%moh%”;
```

Good Luck and Best