



Examiners Committee: 1- Dr. Reda Mabrouk 2- Prof. Osama Abo Seida 3-Dr. Ahmed ElAshry

Q1: Choose the correct answer

(40 Marks)

[1].	Which of the following is not a restriction for a table to be a relation?	A) The cells of the table must contain a single value. B) The columns must be ordered.	C) All of the entries in any column must be of the same kind. D) No two rows in a table may be identical.
[2].	In the relational model, relationships between relations or tables are created by using:	A) composite keys B) candidate keys.	<input checked="" type="checkbox"/> D) foreign keys. D) None of the mentioned
[3].	The following are components of a database except _____.	A) user data B) metadata	<input checked="" type="checkbox"/> C) reports <input checked="" type="checkbox"/> D) indexes
[4].	A key:	A) must always be composed of two or more columns. B) identifies a row.	<input checked="" type="checkbox"/> C) can only be one column. D) identifies a column.
[5].	The SQL WHERE clause:	A) limits the column data that are returned. <input checked="" type="checkbox"/> B) limits the row data are returned.	C) Both A and B are correct. D) Neither A nor B are correct.
[6].	The HAVING clause does which of the following?	A) Acts like a WHERE clause but is used for groups rather than rows. B) Acts like a WHERE clause but is used for columns rather than groups.	C) Acts like a WHERE clause but is used for rows rather than columns. D) Acts EXACTLY like a WHERE clause.
[7].	A view is which of the following?	A) virtual table that can be accessed via SQL commands B) virtual table that cannot be accessed via SQL commands	C) A base table that can be accessed via SQL commands D) A base table that cannot be accessed via SQL commands
[8].	Which of the following are the five built-in functions provided by SQL?	A) COUNT, SUM, AVG, MAX, MIN B) SUM, AVG, MIN, MAX, MULT	C) SUM, AVG, MULT, DIV, MIN D) SUM, AVG, MIN, MAX, NAME
[9].	The SQL keyword BETWEEN is used:	A) for ranges. B) to limit the columns displayed.	C) as a wildcard. D) None of the mentioned

[10].	The wildcards (% , _) in a WHERE clause is useful when?	A) An exact match is necessary in a SELECT statement. B) An exact match is not possible in a SELECT statement.	C) An exact match is necessary in a CREATE statement. D) An exact match is not possible in a CREATE statement.
[11].	After groups have been established, SQL applies predicates in the _____ clause, allowing aggregate functions to be used.	A) Where B) Having	C) Group by D) With
[12].	SELECT emp_name FROM department WHERE dept_name LIKE ' _____ Computer Science'; Which one of the following has to be added into the blank to select the dept_name which has Computer Science as its ending string?	A) % B)	C) D) \$
[13].	All aggregate functions except _____ ignore null values in their input collection.	A) Count(attribute) B) Count(*)	C) Avg D) Sum
[14].	Which of the following should be used to find all the courses taught in the Fall 2009 semester but not in the Spring 2010 semester.	A) <pre>SELECT DISTINCT course_id FROM SECTION WHERE semester = 'Fall' AND YEAR= 2009 AND course_id NOT IN (SELECT course_id FROM SECTION WHERE semester = 'Spring' AND YEAR= 2010);</pre>	C) <pre>SELECT COUNT(DISTINCT ID) FROM takes WHERE (course_id, sec_id, semester, YEAR) IN (SELECT course_id, sec_id, semester, YEAR FROM teaches WHERE teaches.ID= 10101);</pre>
B)	<pre>SELECT DISTINCT course_id FROM instructor WHERE name NOT IN ('Fall', 'Spring');</pre>	D) <pre>(SELECT course_id FROM SECTION WHERE semester = 'Spring' AND YEAR= 2010)</pre>	
[15].	The _____ condition allows a general predicate over the relations being joined.	A) On B) Using	C) Set D) Where
[16].	We can test for the nonexistence of tuples in a subquery by using the _____ construct.	A) Not exist B) Not exists	C) Exists D) Exist
[17].	Aggregate functions can be used in the select list or the _____ clause of a select statement or subquery. They cannot be used in a _____ clause.	A) Where, having B) Having, where	C) Group by, having D) Group by, where

- [12]. Semicolon at the end of each SQL Statement will terminate the SQL statement. ✓
- [13]. During the creation of database schemas, NULL means the field must have a value; whereas, NOT NULL means the field must not have a value. ✗
- [14]. The physical, relational database implementation of a data model is known as a schema ✗
- [15]. The physical implementation of a data attribute; it is the smallest unit of meaningful data to be stored is called a record. ✗
- [16]. We can use DROP statement to remove a database or table permanently from the system. ✓
- [17]. An asterisk is a relational operator ✗ ✗
- [18]. A NULL value is treated as a blank or zero. ✗
- [19]. The relational database equivalent of a file is known as table. ✓
- [20]. SQL provides a JOIN command to join two or more tables across a common field. ✓

Q3: Answer the following question

(10 Marks)

Consider the Student database schema given below:

```

CREATE TABLE Student (
    StudentId int PRIMARY KEY,
    Stud_Name varchar NOT NULL);

CREATE TABLE Course (
    CourseId char(7) PRIMARY KEY,
    Cour_Name varchar NOT NULL,
    NoOfPts int NOT NULL);

CREATE TABLE Enrolled (
    StudentId int NOT NULL REFERENCES Student,
    CourseId char(7) NOT NULL REFERENCES Course,
    Grade char(2),
    PRIMARY KEY (StudentId, CourseId));

CREATE TABLE Stud_Sport (
    StudentId int NOT NULL REFERENCES Student,
    Sport_Name varchar NOT NULL,
    PRIMARY KEY (StudentId, Sport_Name));
  
```

select stud_name from student
where (studentId) in
(select * from enrolled where
(CourseId) in (select courseId
from
Course where
cour_name='Database
Systems'))

1,3

select distinct studentId,
stud_name from student
where (studentId) in
(select * from enrolled where
grade='A-' or grade ='A' or
grade='A+')

2

Write SQL queries for the database above to do the following:

1. Retrieve names of students that have enrolled the course with the name "Database Systems".
2. Retrieve student id's and student names of students that passed at least one course with a grade better than B+ (i.e. A-, A, or A+). Avoid duplicates.
3. Retrieve names of students that have enrolled in Database Systems.

with my best wishes

[34]. A Database Management System is a type of _____ software.	A) It is a type of system software	C) It is a kind of general software
	B) It is a kind of application software	D) None of the mentioned
[35]. In a database Table, the each category of information Is called	A) Tuple	C) Record
	B) Field	D) All of The mentioned
[36]. A set of possible data values is called	A) Attribute	C) Tuple
	B) Degree	D) Domain
[37]. The statement in SQL which allows changing the definition of a table is	A) Alter.	C) Create.
	B) Update.	D) select.
[38]. By default, the ORDER BY clause lists items in _____ order.	A) Descending	C) Same
	B) Any	D) Ascending
[39]. Database _____ which is the logical design of the database, and the database _____ which is a snapshot of the data in the database at a given instant in time.	A) Instance, Schema	C) Relation, Schema
	B) Relation, Domain	D) Schema, Instance
[40]. UPDATE instructor _____ salary= salary * 1.05; Fill in with correct keyword to update the instructor relation.	A) Where	C) Set
	B) In	D) Select

Q2: True or False

(10 Marks)

- [1]. The primary key does not necessarily have to be unique for a given table.
- [2]. The data manipulation language (DML) is used by the DBMS to physically establish record types, fields, and structural relationships. Additionally, the DML defines views of the database.
- [3]. A database is called "self-describing" because it contains a description of itself.
- [4]. The JOIN operation combines relational tables.
- [5]. In a relational database, the three basic operations used to develop useful sets of data are select, form, and join.
- [6]. A data manipulation language (DML) is used to query a database.
- [7]. It is possible that two or more attributes can form a single key.
- [8]. A data definition language (DDL) is used by the DBMS to physically establish record types, fields, and structural relationships. Additionally, the DDL defines views of the database.
- [9]. A Cartesian product of two relations is the same as their union.
- [10]. A foreign key is an attribute in a table that is a primary key in another table.
- [11]. Structured Query Language (SQL) is an internationally recognized standard language that is understood by all commercial database management system products

[25].	<pre>CREATE TABLE employee (id INTEGER, name VARCHAR(20), salary NOT NULL); INSERT INTO employee VALUES (1005, Rach, 0); INSERT INTO employee VALUES (1007, Ross,); INSERT INTO employee VALUES (1002, Joey, 335);</pre> <p>Some of these insert statements will produce an error. Identify the statement.</p>	A) Insert into employee values (1005,Rach,0); B) Insert into employee values (1002,Joey,335); C) Insert into employee values (1007,Ross,); D) None of the mentioned
[26].	<p>What is the difference between a PRIMARY KEY and a UNIQUE KEY?</p> <p>A) Primary key can store null value, whereas a unique key cannot store null value. B) We can have only one primary key in a table while we can have multiple unique keys</p>	C) Primary key cannot be a date variable whereas unique key can be D) None of the mentioned
[27].	<p>_____ is NOT a type of constraint in SQL language?</p> <p>A) foreign key B) primary key</p>	C) unique D) alternate key
[28].	<p>Which of the following statement is correct to display all the cities with the condition, temperature, and humidity whose humidity is in the range of 60 to 75 from the 'whether' table?</p> <p>A) SELECT * FROM weather WHERE humidity IN (60 to 75) B) SELECT * FROM weather WHERE humidity BETWEEN 60 AND 75</p>	C) SELECT * FROM weather WHERE humidity NOT IN (60 AND 75) D) SELECT * FROM weather WHERE humidity NOT BETWEEN 60 AND 75
[29].	<p>What operator tests column for the absence of data?</p> <p>A) Exists B) Not</p>	C) Is Null D) None of the mentioned
[30].	<p>In existing table, DROP TABLE statement is used to</p> <p>A) Add columns B) Add constraints</p>	C) Delete columns D) None of the mentioned
[31].	<p>What does UNION all operator do in a SQL statement?</p> <p>A) Bring all data from the listed tables B) Bring data which is not common from the listed tables</p>	C) Bring all distinct from the listed tables D) Bring common data from the listed tables
[32].	<p>Given a table with the structure: EMPLOYEE (EmpNo, Name, Salary, HireDate), which of the following is not a valid SQL command?</p> <p>A) SELECT * FROM EMPLOYEE WHERE Name LIKE 'Ja%'; B) SELECT COUNT(EmpNo) FROM EMPLOYEE;</p>	C) SELECT COUNT(*) FROM EMPLOYEE WHERE Salary < 30000; D) SELECT HireDate, COUNT(*) FROM EMPLOYEE WHERE Salary < 30000;
[33].	<p>Which of the following command is a type of Data Definition language command?</p> <p>A) Create B) Update</p>	C) Delete D) Merge

<p style="text-align: right;">Which of the following is used to find all courses taught in both the Fall 2009 semester and in the Spring 2010 semester.</p>			
	<pre> SELECT course_id FROM SECTION AS S WHERE semester = 'Fall' AND YEAR= 2009 AND EXISTS (SELECT * FROM SECTION AS T WHERE semester = 'Spring' AND YEAR= 2010 AND S.course_id= T.course_id); </pre>	C)	<pre> SELECT name FROM instructor WHERE salary > SOME (SELECT salary FROM instructor WHERE dept_name = 'Biology'); </pre>
B)	<pre> SELECT COUNT(DISTINCT ID) FROM takes WHERE (course_id, sec_id, semester, YEAR) IN (SELECT course_id, sec_id, semester, YEAR FROM teaches WHERE teaches.ID= 10101); </pre>	D)	<pre> (SELECT course_id FROM SECTION WHERE semester = 'Spring' AND YEAR= 2010) </pre>
[19].	<p>WITH max_budget (VALUE) AS (SELECT MAX(budget) FROM department)</p> <p>SELECT budget FROM department, max_budget</p> <p>WHERE department.budget = MAX budget.value;</p> <p>In the query given above which one of the following is a temporary relation?</p>	A) Budget	C) Value
		B) Department	D) Max_budget
[20].	<pre> SELECT dept_name, ID, avg(salary) FROM instructor GROUP BY dept_name; </pre> <p>This statement is erroneous because</p>	A) Avg(salary) should not be selected	C) Misplaced group by clause
		B) Dept_id should not be used in group by clause	D) Group by clause is not valid in this query
[21].	<p>Which join refers to join records from the right table that have no matching key in the left table are include in the result set:</p>	A) Left outer join	C) Full outer join
		B) Right outer join	D) Half outer join
[22].	<p>In SQL the statement SELECT * FROM R, S is equivalent to</p>	A) Select * from R natural join S	C) Select * from R union join S
		B) Select * from R cross join S	D) Select * from R inner join S
[23].	<p>A _____ indicates an absent value that may exist but be unknown or that may not exist at all.</p>	A) Empty tuple	B) Null value
		B) New value	D) Old value
[24].	<p>The predicate in a where clause can involve Boolean operations such as and. The result of true and unknown is _____ false and unknown is _____ while unknown and unknown is _____</p>	A) Unknown, unknown, false	C) True, unknown, unknown
		B) True, false, unknown	D) Unknown, false, unknown



Q1) Choose the correct answer: (15 points)

1. A _____ is an executing program or process that includes one or more database access.
 a) transaction b) object c) procedure d) application
2. _____ determines the requirements of end-users and develop specifications for those requirements.
 a) database administrators b) application programmers c) auditors d) system analyst
3. _____ is a collection of programs that enables users to create and maintain a database.
 a) RTS b) IS c) DBMS d) AI
4. _____ is the ability to change the schema at one level of a database system without having to change the schema at next higher level.
 a) data exchange b) data dependence c) data binding d) data independence
5. _____ language is used to define both the internal and conceptual scheme when there is no separation between these schemes.
 a) DDL b) DML c) VDL d) SDL
6. _____ may contain virtual data that is derived from the database files or may be a subset of the database.
 a) A query b) A data model c) DBMS d) A view
7. _____ data independence changes the conceptual schema without changing the external schema.
 a) physical b) logical c) low-level d) internal
8. _____ language is used to specify the internal schema.
 a) DDL b) DML c) VDL d) SDL
9. The description of a database is called database _____.
 a) schema b) structure c) construct d) implementation
10. _____ diagrams are important part of object modeling methodology.
 a) ER b) Relational data c) level d) class
11. _____ attributes can have more than one value.
 a) composite b) simple c) multi-valued d) single valued
12. The type of data independence in which conceptual schema can be modified without modifying the External schema is classified as _____.
 a) Physical data independence b) Conceptual Level independence c) External Level independence d) Logical data independence
13. The attribute of a relation schema R which it is not a member of any candidate key is _____.
 a) prime attribute b) undefined attribute c) non-prime attribute d) Super key
14. An entity type without a key attribute is called _____ entity type.
 a) null b) weak c) strong d) single
15. NATURAL JOIN operation is denoted by _____.
 a) U b) π c) X d) *
16. In ER diagrams, the total participation is displayed as a _____.
 a) oval b) single line c) double line d) arrow
17. _____ constraint can be expressed in schema of relational model by using DDL.
 a) schema-based b) inherent model-based c) application-based d) system-based
18. _____ constraint specifies that no two distinct tuples in any state of relational schema can have same values for superkeys.
 a) entity-integrity b) domain c) referential-integrity d) key
19. _____ constraint states that no primary key value can be null.
 a) key b) domain c) referential-integrity d) entity-integrity
20. _____ is the data model that provide concepts that may be easily understood by end user but aren't far removed from the way data is organized in computer storage.
 a) Conceptual data model b) Representation data model c) Physical data model d) None is true
21. _____ constraint states that a tuple in one relation that refers to another relation must refer to an existing tuple in that relation.
 a) key b) domain c) referential-integrity d) entity-integrity
22. _____ symbol is used to denote the SELECT operation.

- a) X b) σ c) ρ d) π
23. _____ symbol is used to denote the PROJECT operation.
 a) X b) σ c) ρ d) π
24. The user of the financial software package that stores a variety of personal financial data is an example of _____.
 a) parametric users b) naive users c) standalone users d) sophisticated users
25. _____ symbol is used to denote the RENAME operation.
 a) X b) σ c) ρ d) π
26. _____ operator is binary.
 a) INTERSECTION b) PROJECT c) SELECT d) RENAME
27. The result of $R (A_1, A_2, \dots, A_n) \times S (B_1, B_2, \dots, B_m)$ is a relation with _____ attributes.
 a) $n + m$ b) $n - m$ c) $n * m$ d) $m - n$
28. _____ operation can be expressed as a sequence of π , \times , and $-$ operations.
 a) DIVISION b) UNION c) JOIN d) CARTESIAN PRODUCT
29. $R \text{ } _____ \text{ } S \equiv (R \cup S) - ((R - S) \cup (S - R))$
 a) U b) \cap c) X d) π
30. The JOIN operation where only matching tuples are kept in the result are called _____ joins.
 a) outer b) external c) inner d) related

Q2) List and write a short Notes about the people associated with the database. (5 points)

المحاضرات

Q3) List and write a short Notes about the three levels of three-tier architecture? (3 Points)

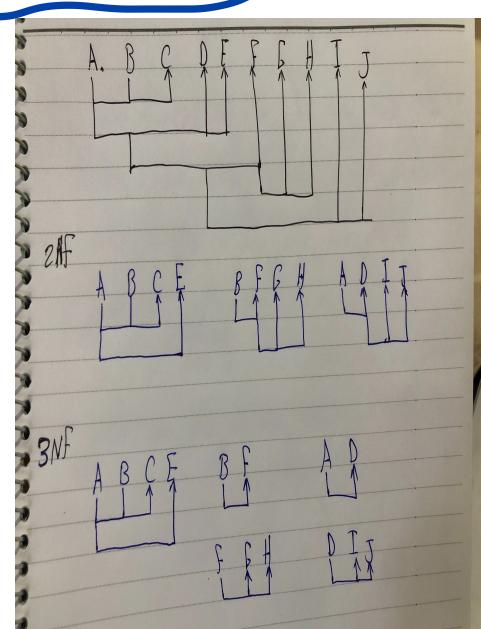
Q4) Consider the universal relation $R = \{A, B, C, D, E, F, G, H, I, J\}$ and the set of functional dependencies $F = \{\{A, B\} \rightarrow \{C\}, \{A\} \rightarrow \{D, E\}, \{B\} \rightarrow \{F\}, \{F\} \rightarrow \{G, H\}, \{D\} \rightarrow \{I, J\}\}$. What is the key for R ? Decompose R into 2NF and then 3NF relations. (5 Points)

Key: A,B

Q5) Write down SQL queries for the following relational algebra expressions: (5 points)

1. $\sigma_{Dno=5 \text{ AND } Salary > 30000} (\text{EMPLOYEE})$
 2. $\pi_{Fname, Lname, Salary} (\sigma_{Dno = 5} (\text{EMPLOYEE}))$
 - 3.
- SMITH $\leftarrow \sigma_{Fname = 'John' \text{ AND } Lname = 'Smith'} (\text{EMPLOYEE})$
 SMITH_PNOS $\leftarrow \pi_{Pno} (\text{WORKS_ON} \bowtie_{Esn = Ssn} \text{SMITH})$
 SSN_PNOS $\leftarrow \pi_{Esn, Pno} (\text{WORKS_ON})$
 SSNS(Ssn) $\leftarrow \text{SSN_PNOS} \div \text{SMITH_PNOS}$
 RESULT $\leftarrow \pi_{Fname, Lname} (\text{SSNS} * \text{EMPLOYEE})$

ده العملي المفروض محلول قبل كذا



Q6) Consider the following ER schema for the MOVIES database. (8 point) Assume that MOVIES is a populated database. ACTOR is used as a generic term and includes actresses. Given the constraints shown in the ER schema, respond to the following statements with *True*, *False*, or *Maybe*. Assign a response of *Maybe* to statements that, although not explicitly shown to be

True, cannot be proven *False* based on the schema as shown. Justify each answer.

1. Every director has been an actor in some movie. **F**

2. No producer has ever been an actor. **F**

3. Some producers have been a director as well. **F**

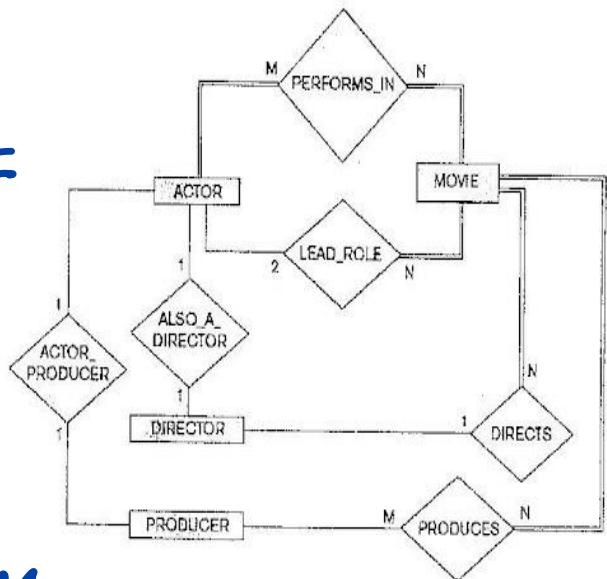
4. Most movies have one director and one producer. **F**

5. A producer cannot be an actor in some other movie. **M**

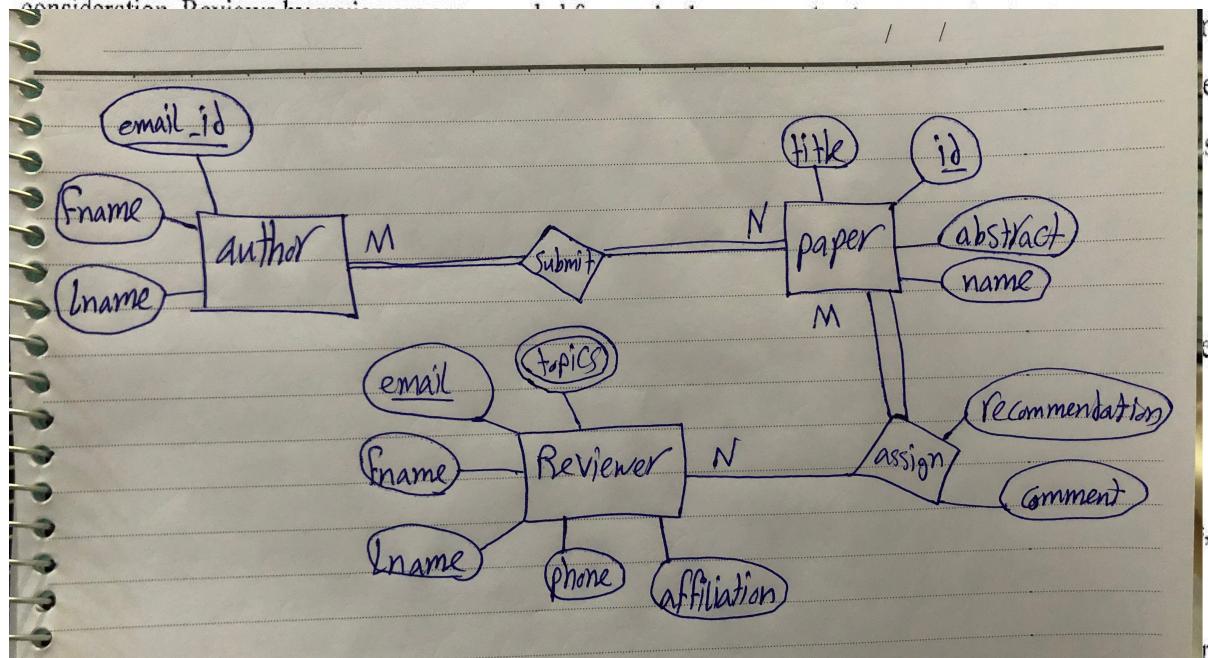
6. There are movies with more than a dozen actors. **M**

7. Some actors have done a lead role in multiple movies. **M**

8. There are some actors who have done a lead role, directed a movie, and produced a movie. **M**



Q7) Consider a CONFERENCE REVIEW database in which researchers submit their research papers for consideration. Reviewers have the ability to assign papers to them and provide recommendations and comments.



her on a scale of 1 to 10 in four categories: technical merit, readability, originality, and relevance to the conference. Finally, each reviewer provides an overall recommendation regarding each paper.

- Each review contains two types of written comments: one to be seen by the review committee only and the other as feedback to the author(s).

Design an entity-relationship diagram for the CONFERENCE REVIEW database. (7 points)

```

use master;
create database School;
use School;
create table Student (student_number int primary key,
class int, major Varchar(3))

```

```

create table Course (Course_name Varchar(50),
Course_number Varchar(10) primary key, credit_hours int, department Varchar(3));

```

```

create table Section(Section_identifier int primary key, Course_number Varchar(10),
year int, instructor Varchar(20),
constraint crsfk foreign key(Course_number) references course(Course_number));

```

```

create table prerequisite(Course_number Varchar(10), prerequisite_number Varchar(10),
constraint crpkf foreign key(Course_number) references course(Course_number),
constraint prfk foreign key(prerequisite_number) references course(Course_number));

```

```

create table grade_report (student_number int, section_identifier int,
grade Varchar(2),
constraint stdfk foreign key(student_number) references student(student_number),
constraint Secfk foreign key(section_identifier) references section(section_identifier));

```

	Course_number	Credit_hours	Department
science	CS1310	4	CS
	CS3320	4	CS
cs	MATH2410	3	MATH
	CS3380	3	CS

GRADE_REPORT

Student_number	Section_identifier	Grade
17	112	B
17	119	C
8	85	A
8	92	A
8	102	B
8	135	A

number
0

اجابته من الصورة، الجزء
بتابع العلاقات بين كل
جدول والثاني



الصورة

1. what are the referential integrity constraints that should hold on the schema? Write appropriate SQL

DDL statements to define the database. (2 points)

use schema of the following figure.

ring in 'cs' (computer science). (1 point)

ofes

ieve

or st

① insert into student values('Johnson', 25, 1, 'Math')

② update student set class=2 where name='Smith'

③ insert into course values('Knowledge Engineering', 'CS4390', 3, 'cs')

④ delete student where name='Smith' and student_number=17

in the database schema shown in the following figure.

in the database. (1 point)

oint)

ng, 'cs4390', 3, 'cs'. (1 point)

is 'Smith' and whose student number is 17. (1 point)

① Select name from student where major='cs';

② Select C.Course_name from Course C join section S
on C.Course_number=S.Course_number and S.instructor='king'
and (S.year='07' or S.year='08')

③ Select S.Course_number,S.Semester,S.year,COUNT(*) from Section S,grade_report
where S.Section_identifier=grade_report.section_identifier and S.instructor='king'
group by S.Course_number,S.Semester,S.year

④ Select name,Course_name,Course.Course_number,credit_hours,year,grade
from student,Course,Section,grade_report where class=4 and major='cs'
and student.student_number=grade_report.student_number
and Course.Course_number=Section.Course_number
and Section.Section_identifier=grade_report.Section_identifier

⑤ Select name,major from student where not exists
(Select * from grade_report where student_number=student.student_number and
not(grade=A))

⑥ Select name,major from student where not exists
(Select * from grade_report where student_number=student.student_number and grade=A)