UNIVERSITY OF COLOMBO, SRI LANKA

UNIVERSITY OF COLOMBO SCHOOL OF COMPUTING

DEGREE OF BACHELOR OF INFORMATION TECHNOLOGY (EXTERNAL)

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IT2305 : Database Systems I

Multiple Choice Question Paper

26th July 2015

(TWO HOUR)

Important Instructions :

- The duration of the paper is **2 (two) hour**.
- The medium of instruction and questions is English.
- The paper has **45 questions** and **16 pages**.
- All questions are of the MCQ (Multiple Choice Questions) type.
- All questions should be answered.
- Each question will have 5 (five) choices with **one or more** correct answers.
- All questions will carry equal marks.
- There will be a penalty for incorrect responses to discourage guessing.
- The mark given for a question will vary from 0 (*All the incorrect choices are marked & no correct choices are marked*) to +1 (*All the correct choices are marked & no incorrect choices are marked*).
- Answers should be marked on the special answer sheet provided.
- Note that questions appear on both sides of the paper. If a page is not printed, please inform the supervisor immediately.
- Mark the correct choices on the question paper first and then transfer them to the given answer sheet which will be machine marked. **Please completely read and follow the instructions given on the other side of the answer sheet before you shade your correct choices.**

1) What are the advantages of the database approach as aganst the file processing approach?

(a) Data redundancy is minimized.
(b) Changes to the data structure may not require changing all programs that use the relevant data.
(c) Multiple users can access the database under necessary constraints.
(d) Data can be manipulated using database functions.
(e) Reports can be generated according to the various user requests by accessing the stored data.

2) Consider the following statements.

(I) A Data definition language defines the different data structures in the database.
(II) A Data definition language uses the general enquiry facility of the data.
(III) All specifications of the data definition language is stored in the database.

Which of the above is/are correct?

(a) (I) and (II) only (b) (I) and (III) only (c) (II) and (III) only
(d) None (e) All

3) What does a System Catalog keep track of?

(a) Elementary-level data items (fields/attributes)
(b) Relationships that exist between data stored in tables
(c) Table structures
(d) Index structure and storage
(e) Privileges and other security information

4) Which of the following statements is/are correct in relation to 3 Level ANSI/SPARC architecture?

(a) Physical data independence is the ability to change the conceptual schemas without having to change the internal schemas.
(b) The external level is the user's view of the database and it only contains the relevant data for the user.
(c) The conceptual level contains and describes what data is stored within the whole database and how the data is interrelated.
(d) The internal level describes how the data is actually stored in the database and on the computer hardware.
(e) Mapping between two levels create an overhead during execution of the query or program.

5) Which of the following is/are **not** characteristic(s) of the relational data model?

(a) Tuple ordering is a part of a relation definition because a relation attempts to represent facts at a logical or abstract level.
(b) Each value in a tuple is inseperable into components within the framework of the basic relational model.
(c) Each tuple in the relation can be interpreted as a particular instance of the assertion.
(d) All the attributes in different relations must have different names.
(e) A common method of specifying a domain for an attribute is to specify a data type.

6) Which of the following statements is/are true about surrogate key?

(a) Surrogate keys cannot be used as primary keys.
(b) Surrogate keys can be used as primary keys.
(c) If any relation has more than one candidate key, then after choosing the primary key from those candidate keys, rest of candidate keys are known as surrogate keys of that table.
(d) An auto-generated numeric or GUID column in the table that uniquely identifies each row is called a surrogate key.
(e) If a primary key of a table consists of more than one column then the primary key is also called a surrogate key.

7) Consider the following *Employee* relation with the given attributes and data types. Assume that the attributes are stated in the order that they were specified in the create table statement.

```
Employee ( EmpID VARCHAR(05), Name VARCHAR(40), Gender CHAR(06),
  AnnualSalary REAL, HourlyPay REAL, HoursWorked INT, Discriminator
  VARCHAR(15))
```

Consider the following details of 2 employees.

```
EmpID – 10344, Name – 'Akila Jayawardena', Gender – 'Male',
AnnualSalary – 120000, Discriminator – 'Permanent Employee'

EmpID – 10067, Name – 'Nimalee Werathunga', Gender – 'Female',
HourlyPay – 200, HoursWorked – 182, Discriminator – 'Contract
Employee'
```

Which of the following SQL statements will insert above data into the Employee relation?

(a) INSERT INTO Employee (EmpID, Name, Gender, AnnualSalary, Discriminator)
VALUES ('10344', 'Akila Jayawardena', 'Male', 120000, 'Permanent Employee');
INSERT INTO Employee (EmpID, Name, Gender, HourlyPay, HoursWorked, Discriminator)
VALUES ('10067', 'Nimalee Werathunga', 'Female', 200, 182, 'Contract Employee');

(b) INSERT INTO Employee
VALUES ('10344', 'Akila Jayawardena', 'Male', 120000, 'Permanent Employee');
INSERT INTO Employee
VALUES ('10067', 'Nimalee Werathunga', 'Female', 200, 182, 'Contract Employee');

(c) INSERT INTO Employee (EmpID, Name, Gender, AnnualSalary, Discriminator)
VALUES ('10344', 'Akila Jayawardena', 'Male', '120000', 'Permanent Employee');
INSERT INTO Employee (EmpID, Name, Gender, HourlyPay, HoursWorked, Discriminator)
VALUES ('10067', 'Nimalee Werathunga', 'Female', '200', '182', 'Contract Employee');

(d) INSERT (EmpID, Name, Gender, AnnualSalary, Discriminator) VALUES ('10344', 'Akila Jayawardena', 'Male', 120000, 'Permanent Employee') INTO Employee;
INSERT (EmpID, Name, Gender, HourlyPay, HoursWorked, Discriminator)
VALUES ('10067', 'Nimalee Werathunga', 'Female', 200, 182, 'Contract Employee') INTO Employee;

(e) INSERT INTO Employee (EmpID, Name, Gender, AnnualSalary, Discriminator)
VALUES (10344, 'Akila Jayawardena', Male, 120000, 'Permanent Employee');
INSERT INTO Employee (EmpID, Name, Gender, HourlyPay, HoursWorked, Discriminator)
VALUES (10067, 'Nimalee Werathunga', Female, 200, 182, 'Contract Employee');

8) Three queries given in (I) (II) and (III) below were written to achieve the name of the student who has the highest marks.

(I)
```
SELECT studentName FROM Result
WHERE mark IN (SELECT MAX(mark) From Result);
```

(II)
```
SELECT studentName FROM Result
WHERE mark >= ALL (SELECT mark FROM Result);
```

(III)
```
SELECT L1.studentName FROM Result As L1 LEFT OUTER JOIN
Result AS L2 ON L1.mark < L2.mark
WHERE L2.mark IS NULL;
```

Which of the following statements is/are correct with respect to the above three queries?

(a) Only query (I) will give the correct results.
(b) Only queries (I) and (II) will give the correct results.
(c) All three queries will give the correct results.
(d) Query (III) will give a syntax error.
(e) All queries will give results which are not relevant to the given requirement.

Consider a part of the university database which has following tables to answer Questions 9 to 10.

Student (student_id, student_name, year, GPA)
Course (course_id, course_name, credits, dept_id)
Enroll (student_id, course_id, mark, grade)

9) Which of the following SQL statements would find all Student names who have marks below 80 for the course SCS1008 in ascending order?

(a) SELECT student_name From Student
WHERE student_id IN (SELECT student_id FROM Enroll
WHERE course_id = "SCS1008" AND mark < 80) ORDER BY student_name ASC;
(b) SELECT DISTINCT stu.student_name FROM Student AS stu, Enroll AS enr
WHERE stu.student_id = enr.student_id AND enr.course_id = "SCS1008" AND enr.mark < 80
ORDER BY stu.student_name ASC;
(c) SELECT stu.student_name FROM Student AS stu, Enroll AS enr
WHERE stu.student_id = enr.student_id AND enr.course_id = "SCS1008" AND enr.mark < 80
ORDER BY UNIQUE (stu.student_name) ASC;
(d) SELECT stu.student_name FROM Student AS stu, Enroll AS enr
WHERE stu.student_id = enr.student_id AND enr.course_id = "SCS1008" AND enr.mark < 80
ORDER BY stu.student_name;
(e) SELECT stu.student_name FROM Student AS stu
WHERE stu.student_id IN (SELECT enr.student_id FROM Enroll AS enr
WHERE stu.student_id = enr.student_id AND enr.course_id = "SCS1008" AND enr.mark < 80)
ORDER BY stu.student_name ASC;

10) Which of the following statements correctly give(s) the list of course numbers having average marks lower than 50?

(a) SELECT course_id, AVG(mark) FROM Enroll ORDER BY course_id HAVING AVG(mark)<50;
(b) SELECT course_id, AVG(mark) FROM Enroll HAVING AVG(mark)<50;
(c) SELECT course_id, AVG(mark) FROM Enroll WHERE AVG(mark)<50;
(d) SELECT course_id, AVG(mark) FROM Enroll GROUP BY course_id WHERE AVG(mark)<50;
(e) SELECT course_id, AVG(mark) FROM Enroll GROUP BY course_id HAVING AVG(mark)<50;

Consider the following relational schema to answer Question 11 to 13.

Flight (Flight_No, From_city, To_city, Date, Departure_time, Arrival_time, Stops_on_route)
Reservation (Reservation_id, Passenger_id, Flight_No, No_of_seats, reservation_date, Purchase_notified)
Passenger (Passenger_id, Name, Email, Citizenship)

11) Which of the following statements would change the Flight table by removing the default of 'Colombo' for the From-City column and adding a new column representing the airline.

(a) ALTER TABLE Flight From_City DROP DEFAULT;
ALTER TABLE Flight ADD Airline Varchar(20);
(b) ALTER TABLE Flight ALTER From_City DELETE DEFAULT;
ALTER TABLE Flight ADD Airline SET Varchar(20);
(c) ALTER TABLE Flight ALTER From_City DROP DEFAULT;
ALTER TABLE Flight ADD Airline Varchar(20);
(d) ALTER TABLE Flight ALTER From_City DROP DEFAULT;
ALTER TABLE Flight ADD Airline SET Varchar(20);
(e) ALTER TABLE Flight From_City DELETE DEFAULT;
ALTER TABLE Flight ADD Airline Varchar(20);

12) Consider the following data elements in Flight relation.

```
Flight_No      - UL570
From_city      - Colombo
Date           - 2015-03-30
Departure_time - 2015-03-30 14:25:00
Stops_on_route - 1
```

Select the best possible data type for each data element respectively from the following,

(a) CHAR, VARCHAR, DATE, DATETIME, NUMBER
(b) CHAR, VARCHAR, DATE, DATETIME, INTEGER
(c) VARCHAR, VARCHAR, DATE, TIME, INTEGER
(d) TEXT, TEXT, DATE, DATETIME, INTEGER
(e) CHAR, CHAR, DATE, TIME, NUMBER

13) Which of the following statements is/are true in relation to keys of the above tables?

(a) Flight_No is the primary key of Flight table and a foreign key of Reservation table.
(b) Passenger_id and Flight_No are foreign keys of the Reservation table.
(c) Passenger_id, Flight_No and Reservation_id are primary keys of the Reservation table.
(d) Passenger_id and Flight_No are candidate keys of the Reservation table
(e) Passenger_id is a foreign key for both Passenger and Reservation tables.

14) Suppose relation R1(X,Y) has tuples `{(a,1), (b,2), (c, NULL), (c,2)}` and relation R2(Y,Z) has tuples `{(1,p),(2,q), (2,r), (NULL, r),(NULL, s)}`.

Consider the following SQL query.

```
SELECT * FROM R1 LEFT OUTER JOIN R2 ON R1.Y = R2.Y;
```

What would be the number of tuples in the result of the above SQL query?

(a) 4 (b) 5 (c) 6
(d) 7 (e) 8

The next three Questions 15 to 17 are based on the following two tables: PAINTER, PAINTING.

PAINTER

PTR_NUM	LASTNAME	FIRSTNAME	AREACODE	PHONE
11001	Nissanka	Sanjeewa	033	5674035
11002	Batawala	Jeewan	011	2228323

PAINTING

PNTG_NUM	TITLE	PRICE	PTR_NUM
1001	A Cart in the early morning	2500.00	11001
1002	A Monk	6000.00	11001
1003	After fishing	600.00	11002
1004	A sail boat	1500.00	11001
1005	Getting Ready for the day	800.00	11002

A painter might paint many paintings and each painting is painted by one painter. One cannot delete a painter as long as there is a painting that references that painter. However, if one makes a change in any painter's PTR_NUM, this change must reflect throughout the system.

15) Which SQL statement would create the PAINTING table considering the above constraints?

(a) CREATE TABLE PAINTING (
PNTG_NUM INT, TITLE VARCHAR(50), PRICE FLOAT(7,2), PTR_NUM INT,
PRIMARY KEY (PNTG_NUM),
FOREIGN KEY (PTR_NUM) REFERENCES PAINTER(PTR_NUM) ON DELETE RESTRICT ON UPDATE CASCADE);

(b) CREATE TABLE PAINTING (
PNTG_NUM INT, TITLE VARCHAR(50), PRICE FLOAT(7,2), PTR_NUM INT,
PRIMARY KEY (PNTG_NUM),
FOREIGN KEY (PTR_NUM) REFERENCES PAINTER(PTR_NUM) ON UPDATE CASCADE);

(c) CREATE TABLE PAINTING (
PNTG_NUM INT, TITLE VARCHAR(50), PRICE FLOAT(7,2), PTR_NUM INT,
PRIMARY KEY (PNTG_NUM),
FOREIGN KEY (PTR_NUM) REFERENCES PAINTER(PTR_NUM) ON DELETE RESTRICT);

(d) CREATE TABLE PAINTING (
PNTG_NUM INT, TITLE VARCHAR(50), PRICE FLOAT(7,2), PTR_NUM INT,
PRIMARY KEY (PNTG_NUM),
FOREIGN KEY (PTR_NUM) REFERENCES PAINTER(PTR_NUM) ON DELETE CASCADE ON UPDATE RESTRICT);

(e) CREATE TABLE PAINTING (
PNTG_NUM INT, TITLE VARCHAR(50), PRICE FLOAT(7,2), PTR_NUM INT,
PRIMARY KEY (PNTG_NUM),
FOREIGN KEY (PTR_NUM) REFERENCES PAINTER(PTR_NUM) ON DELETE CASCADE);

16) Assuming Gampaha area code is 033, consider the following query.

```
SELECT PAINTING.PTR_NUM FROM PAINTER, PAINTING
WHERE PAINTER.PTR_NUM = PAINTING.PNTR_NUM AND AREACODE = "033"
GROUP BY PTR_NUM HAVING COUNT(*)>5;
```

The result of the above is best described as

(a) List the PTR_NUMs of all the painters who live in Gampaha if there are more than 5 painters from Gampaha.
(b) List the PTR_NUMs of all the painters if there are more than 5 paintings from the painters from Gampaha.
(c) List the PTR_NUMs of all the painters who live in Gampaha if the total number of painters is more than 5.
(d) List the PTR_NUMs of all the painters who have at least 5 paintings or live in Gampaha.
(e) List the PTR_NUMs of all the painters who live in Gampaha and have more than 5 paintings.

17) We execute the following sequence of modifications over the PAINTING relation. Suppose the relation has been created considering the above mentioned constraints.

```
UPDATE PAINTING SET PRICE = PRICE + 500
     WHERE PTR_NUM = 11002;
DELETE FROM PAINTING WHERE PNTG_NUM = 1004;
INSERT INTO PAINTING VALUES(1006, "The Girl on the Beach",
3500.00, 11002);
DELETE FROM PAINTER WHERE PTR_NUM = 11001;
```

At the end of these statements, the sum of the painting prices over all the tuples in PAINTING relation is:

(a) 5,900	(b) 14,400	(c) 12,400
(d) 10,900	(e) 15,900	

18) Suppose relation T1 (A, B) has n tuples and relation T2 (A, C) has m tuples.
Consider the following SQL query.

```
SELECT A, C FROM T1, T2;
```

What would be the number of tuples in the result of the above SQL query?

(a) N	(b) m	(c) n*m
(d) n+m	(e) Query gives an Error	

19) Consider a table created using the following SQL statement.

```
CREATE TABLE DISTANCE( NAME VARCHAR(20) NOT NULL,
DISTANCE INT);
```

Also consider the following two SQL statements.

(I) `SELECT * FROM DISTANCE WHERE DISTANCE = NULL;`
(II) `SELECT * FROM DISTANCE WHERE DISTANCE IS NULL;`

We wish to find out the names of those who have **not** yet provided the distance. Which of the above SQL statements would give the correct output?

(a) Only query (I) will give the correct result.
(b) Only query (II) will give the correct result.
(c) Both queries (I and II) will give the correct result.
(d) Both queries will give an empty set.
(e) Both queries will give an error.

Use the schema given below to answer the Questions 20 to 23.

Project(Pid, Duration, Start_Date, End_Date)
Employee(Eid, Ename, Salary)
Involves(Pid, Emp_Id, Duration)

20) Which of the following sequence of operations would find the ids of the employees (Eid) who get more than Rs. 20,000 salary and who have worked more than 5 years on project 5?

(a) $\pi_{Eid}(\sigma_{Pid=5}(\sigma_{Salary>20000}(\text{Employee}) \bowtie_{Eid=Emp\_Id} \sigma_{Duration>5}(\text{Involves})))$
(b) $\pi_{Eid}(\sigma_{Pid=5}(\sigma_{Salary>20000}(\text{Employee})) \bowtie_{Eid=Emp\_IdEmp\_Id} (\sigma_{Duration>5}(\text{Involves})))$
(c) $\pi_{Eid}(\sigma_{Salary>20000}(\text{Employee})) \cap \pi_{Emp\_Id}(\sigma_{Duration>5 \text{ and } Pid=5}(\text{Involves}))$
(d) $\pi_{Eid}(\sigma_{Salary>20000 \text{ and } Duration>5 \text{ and } Pid=5}(\text{Employee} * \text{Involves}))$
(e) $\pi_{Eid}(\sigma Pid=5 (\sigma_{Salary>20000 \text{ and } Duration>5}(\text{Employee} \cap \text{Involves})))$

21) Consider the sequence of operations performed on the following relations.

R1 -> $\pi_{Pid}(\sigma_{Duration=3}(\text{Project}))$
R2 -> $\pi_{Pid}(\sigma_{Emp\_Id=5}(\text{Involves}))$
R3 -> R2 ∩ R1

What will the above sequence of operations produce?

(a) The Pids of the projects which have durations longer than 3 years and participated by employee id 5
(b) The Pids of the projects which have durations of 3 years or participated by employee id 5
(c) The Pids of the projects which have durations less than 3 years and participated by employee id 5
(d) The Pids of the projects which have durations of 3 years and involved by employee id 5
(e) The Pids of the projects which have durations longer than 3 years which are not participated by employee id 5

22) Consider the SQL query given below.

```
SELECT Eid FROM Employee E WHERE Salary < 40000 AND
NOT EXISTS ( SELECT * FROM Involves I
                  WHERE I.Duration < 3 AND I.Emp_Id = E.Eid )
```

What would be the corresponding sequence of relational algebra operations for the above query?

(a) $\pi_{Eid}(\sigma_{Salary<40000}(\text{Employee})) \cap \pi_{Eid}(\sigma_{Duration<3}(\text{Involves}))$
(b) $\pi_{Eid}(\sigma_{Salary<40000 \text{ and } Duration<3}(\text{Employee} - \text{Involves}))$
(c) $\pi_{Eid}(\sigma_{Salary<40000}(\text{Employee}) - \sigma_{Duration<3}(\text{Involves}))$
(d) $\pi_{Eid,Salary}(\sigma_{Salary<40000}(\text{Employee})) \div \pi_{Cid}(\sigma_{Duration<3}(\text{Involves}))$
(e) $\pi_{Eid}(\sigma_{Salary<40000}(\text{Employee})) - \pi_{Eid}(\sigma_{Duration<3}(\text{Involves}))$

23) Suppose that two relations R and S have exactly the same schema and I and J tuples, respectively,

(I) Union of R and S contain exactly (I + J) tuples.
(II) Cartesian product of R and S contain I * J tuples.
(III) The number of tuples in the intersection of R and S is always less than I.
(IV) The number of tuples in the R - S is always less than I.

Which of the above statements is correct?

(a) (I) only (b) (II) only (c) (I) and (II) only
(d) (I) and (III) only (e) (IV) only

24) Let R = (A, B, C) be a schema with attributes A,B,C and let r1 and r2 both be relations on schema R. The following relational algebra expressions are given along with SQL statements and each SQL statement is considered as producing the equivalent output as its corresponding relational algebra expression.

(I)	π_{BC} (r1 ∩ r2)	`SELECT * FROM r1` `WHERE (A, B, C) IN (SELECT * FROM r2);`
(II)	π_{AC} (r1) $\rtimes$ π_{BC} (r2)	`SELECT r1.A, r2.B, r2.C FROM r1 RIGHT JOIN r2` `WHERE r1.c = r2.c;`
(III)	π_{A} (r1) * π_{B} (r2)	`SELECT A, B FROM r1, r2;`

Which of these are correct?

(a) (I) only	(b) (II) only	(c) (III) only
(d) (I) and (II) only	(e) (II) and (III) only	

25) The characteristics of a suitable set of relations are listed as follows.

(I) The minimal number of attributes necessary to support the data requirements of the enterprise
(II) Attributes with a close logical relationship
(III) Minimal redundancy

Which of these are correct?

(a) (I) and (II)	(b) (I) and (III)	(c) (II) and (III)
(d) None	(e) All	

Consider the relation R1 (A, B, C, D, E) with the given Functional Dependencies to answer Questions from 26 to 27.

D → EF CD → A A → B

26) What is/are the candidate key(s) of the relation R1?

(a) (C, E)	(b) (C, A)	(c) (C, D)
(d) D	(e) C	

27) Which of the following statements is/are true?

(a) The Functional dependency C → A violates 1 NF.
(b) The best normal form of the relation R1 satisfies is 1 NF.
(c) The Functional dependency A → B violates 2 NF.
(d) The best normal form of the relation R1 satisfies is 2 NF.
(e) The Functional dependency A → B violates 3 NF.

Consider the relation UNIVERSITY(student, course, teacher) to answer Questions 28 to 30.

Assume that there are the following semantic rules for the above relation.

(i) Each student may attend several courses.
(ii) Each course may have several students.
(iii) Each course has only one teacher.
(iv) Each teacher may have several courses.

28) Based on the rules given in (i)-(iv), which of the following functional dependencies exist in UNIVERSITY?

(a) Course → Student
(b) Teacher, Student → Course
(c) Course → Teacher
(d) (Course, Student) → Teacher
(e) Teacher → Student

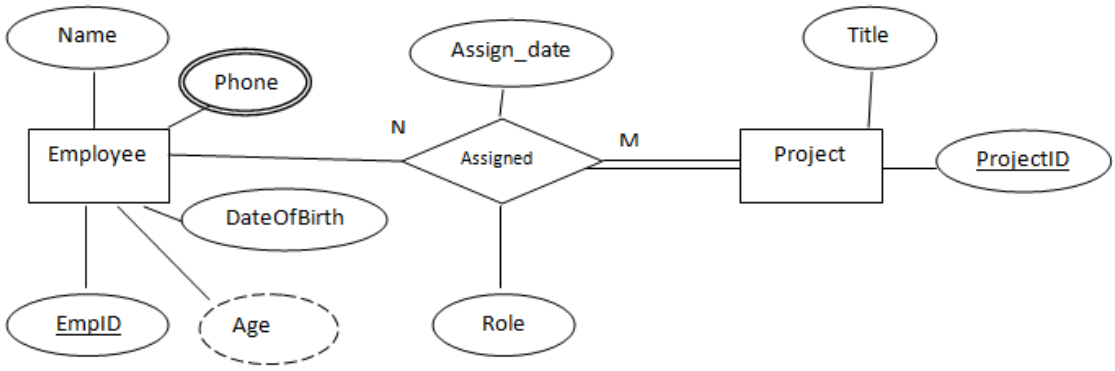
29) What is the candidate key of UNIVERSITY?

(a) Student, Teacher (b) Course (c) Teacher
(d) Course, Student (e) Course, Teacher

30) Which of the following statements is/are true with respect to the relation UNIVERSITY?

(a) The highest normal form of UNIVERSITY is 1NF.
(b) The highest normal form of UNIVERSITY is 2NF.
(c) The highest normal form of UNIVERSITY is 3NF.
(d) The functional dependency Course → Teacher violates 3NF.
(e) The functional dependency Course → Student violates 2NF.

Consider the following ER diagram to answer Questions from 31 to 33.



A student considered the above ER diagram and mapped it correctly into corresponding relations.

31) What would be the corresponding relations when the Employee entity is mapped?

(a) Employee (EmpID, Name, DateOfBirth)
(b) Employee (EmpID, Name, DateOfBirth, Age)
(c) Employee (EmpID, Name, DateOfBirth, Phone, Age)
(d) Employee (EmpID, Name, DateOfBirth, ProjectID, Assign _Date, Role)
(e) Emp_Phone (EmpID, Phone)

32) What are the other relations when rest of the entities are mapped?

(a) Project (ProjectID, Title, EmpID, Assign _Date, Role)

(b) Project (ProjectID, Title, Assign _Date, Role)

(c) Assigned (EmpID, ProjectID, Assign _Date, Role), Project (ProjectID, Title)

(d) Assigned (EmpID, Assign _Date, Role), Project (ProjectID, Title)

(e) Project (ProjectID, Title), Assigned (Assign_Date, Role)

33) Which of the following statements is/ are true?

(a) An Employee may exist without any project and a project may not exsits without any Employees.
(b) Examples for derived attribute and stored attribute are DateOfBirth and Age respectively.
(c) The participation of Project in Assigned is called existence dependency.
(d) Relationship between Employee and Project is binary and many to many.
(e) 'Age' is a composite attribute and 'Phone' is a multivalued attribute.

34) Which of these statements is/are true with regard to weak entities?

(a) Weak entities can sometimes represent a complex attribute.
(b) A weak entity type always has a total participation constraint with respect to its identifying relationship and every existence dependency results in a weak entity.
(c) Weak entities having a partial key or discriminator is represented by a dashed line.
(d) Any number of levels of weak entity types can be defined but an owner entity type may not itself be a weak entity type.
(e) Weak entities do not have key attributes of their own.

Consider the following scenario to answer Questions 35 to 38.

ABC College has planned to implement a Teachers' Information Management System (TIMS) for their college. The purpose of this system is to identify and manage teachers' responsibilities and tasks. This TIMS uses a database to store the information about teachers, classes and all the subjects.

The employee number, name, address, contact no, the date of appointment, username, password and job role (whether principal or teacher) should be stored in that TIMS. All the teachers and the principal can access to TIMS.

All the subjects for each Grade should be stored and identified uniquely. subject_code, subject_name, grade are stored in TIMS. The teachers are allocated for subjects. Most of the teachers allocated for one subject and there are some cases that a teacher teaches more than one subject. For one particular subject there can be more than one teacher allocated.

There are five classes for one Grade in the college and each classroom can be uniquely identified from the class code and with the class code, the grade, the location and the teacher in charge should be recorded. One teacher is assigned as teacher in charge for only one class and there is only one teacher in charge for each class.

35) Based on the above scenario which relationship(s) would exist in the related ER/EER diagram?

(a) 1:N – assigns between Teacher and Principal
(b) 1:1 – incharge between Teacher and Class
(c) 1:N – allocate between Teacher and Subject
(d) M:N – allocate between Teacher and Subject
(e) 1:N – has between Class and Grade

36) Based on the above scenario, how would be the "job role" presented?

(a) As an attribute of the relationship between Teacher and Class
(b) As a multi valued attribute of Teacher
(c) As a composite attribute of Teacher
(d) As a separate entity in relationship with Teacher
(e) As an attribute of Teacher

37) When the ER/EER diagram related to above scenario is mapped, what would be corresponding to Class relation?

(a) Class (class_code, location, grade)
(b) Class (class_code, employee_no, location)
(c) Class (class_code, employee_no, location, grade)
(d) Class (class_code, location)
(e) Class (class_code, employee_no, location, grade, role)

38) Assume ABC College newly established two different Teacher categories namely: "Permanent" and "Contract". Permanent teachers are paid a monthly salary and for contract teachers the contract period has to be recorded for their payments.

Which would be correct with respect to ER/EER diagram of above requirement?

(a) An attribute named category is added to the Teacher entity.
(b) The specialization implies a total and disjoint constraint.
(c) The specialization implies a total and overlapping constraint.
(d) The set of subclasses {Permanent, Contract} is a specialization of the superclass Teacher that distinguishes among teacher entities based on the category of each teacher entity.
(e) The specialization implies a partial and disjoint constraint.

39) Consider the following statements regarding data views.

(I) A view has to be always up-to-date.
(II) Views defined using grouping and aggregate functions are updateable.
(III) By using the 'WITH CHECK OPTION' the system can check for view updatability and plan an execution strategy to update through a view table.

Which of the above are correct?

(a) (I) only (b) (I) and (II) only (c) (I) and (III) only
(d) (II) and (III) only (e) All

Consider the following tables based on a Sales Management System to answer Questions 40 to 41.

Staff(<u>Sno</u>, Sname, Job_role)
Item(<u>Itemno</u>, Description, Unit_price)
Invoice(<u>Inv_no</u>, Customer_name, *Item_no*, Quantity, Total_amount , *Rep_id*, *Area_manager_id*)

Assumptions

- **All details about area managers and sales representatives are stored in staff table and values for job role are "area_manager" and "sales_rep".**
- **Only one item can be issued using one invoice.**
- **In invoice table, the *Rep_id* means the Sno of the representative who issued the invoice and *Area_manager_id* means the Sno of the area manager who is the in charge of that area.**

40) With the use of view called TotSale, Area Manager is able to check the total sales for each sales representative. Consider the following three create view statements.

(I)
```
CREATE VIEW TotSale AS
SELECT Sno, SUM(Total_amount) AS Tsales
FROM Staff, Invoice
WHERE Staff.Sno = Invoice.Rep_id
AND Staff.Job_role = "sales_rep"
GROUP BY Sno;
```

(II)
```
CREATE VIEW TotSale AS
SELECT Sno, SUM(Total_amount) AS Tsales
FROM Staff s, Invoice i
WHERE s.Sno = i.Rep_id
AND s.Job_role = "sales_rep"
GROUP BY Sno
Having Tsales>0;
```

(III)
```
CREATE VIEW TotSale AS
SELECT Rep_id, SUM(Total_amount) AS Tsales
FROM Invoice
GROUP BY Rep_id;
```

Which of the above SQL statements would have been used in creating the TotSale view?

(a) (I) only	(b) (I) and (II) only	(c) (I) and (III) only
(d) All	(e) (II) and (III) only	

41) It is necessary to create a view called Sale_Range to track the sales representatives who obtained total sales of more than Rs.10000.00.

(I)
```
CREATE VIEW Sale_Range AS
SELECT Sname FROM  TotSale
WHERE Tsales>10000;
```

(II)
```
CREATE VIEW Sale_Range AS
SELECT Sno, SUM(Total_amount) As Tsales
FROM  Invoice
GROUP BY Sno
WHERE Tsales>10000;
```

(III)
```
CREATE VIEW Sale_Range AS
SELECT Sno, SUM( Total_amount ) AS Tsales
FROM Staff s, Invoice i
WHERE s.Sno = i.Rep_id
AND s.Job_role = "sales_rep"
GROUP BY Sno
HAVING Tsales > 10000;
```

Which of the above SQL statements would one execute to create the Sale_Range view?

(a) (I) only	(b) (II) only	(c) (I) and (II) only
(d) (II) and (III) only	(e) (III) only	

Consider these tables which are used for a single banking system to answer Questions 42 to 43.

Branch(<u>Code</u>, Branch_name, City, Assets)
Employee(<u>Emp_no</u>, Emp_name, Job_role, *Branch_code*)
There is a user account named as 'dataentry' which has been created by DBA. The data insertion for the 'Branch' table is done by DBA and the other users do not have the permission to insert or update or delete data in the 'Branch' table.

42) Assume DBA wanted to give the user 'dataentry' the permissions with grant propagation to retrieve all the data in 'Branch' table except attribute 'Assets'. Which of the following SQL statements should be executed by the DBA to give the above permissions with a higher security?

(I)
```
GRANT SELECT ON Branch EXCEPT(Assets) TO dataentry WITH GRANT
OPTION;
```

(II)
```
CREATE VIEW  Branch_details AS SELECT * EXCEPT(Assets) FROM
Branch WITH GRANT OPTION;
```

(III)
```
CREATE VIEW Branch_details AS SELECT Code, Branch_name, City
FROM Branch WITH GRANT OPTION;
```

(IV)
```
GRANT SELECT ON Branch_details TO dataentry WITH GRANT OPTION;
```

(a) (I) only	(b) (III) only
(c) First execute (II) and then (IV)	(d) First execute (III) and then (IV)
(e) First execute (II), then (III) and finally (IV)	

43) DBA created the following view. Emp_details(Emp_no, Emp_name, Branch_name, City, Job_role) and gave the privilege to 'dataentry' to update some columns of the view without grant propagation by executing the following SQL statement.

```
GRANT UPDATE ON Emp_details(Emp_name, Branch_name, City) TO
dataentry;
```

Although DBA gave 'dataentry' the permission to update, 'dataentry' could not execute the SQL statements to update the view. Finally DBA executed SQL statement(s) to rectify the issue. What would be that/those statement(s)?

(a) GRANT SELECT ON Emp_details TO dataentry;
(b) GRANT UPDATE ON Emp_details(Emp_name, Branch_name, City) TO dataentry WITH GRANT OPTION ;
(c) REVOKE UPDATE ON Emp_details FROM dataentry;
(d) REVOKE SELECT ON Emp_details FROM dataentry;
(e) DROP Emp_details FROM dataentry;

Consider the following scenario to answer Questions 44 to 45.

Customer(Custid, Name)
Account(AcctNo, Balance, AcctType, *Custid*, Branch)

DBA created 3 users named as X1, X2 and X3. DBA executed the following SQL statements.

- **CREATE VIEW Acct_view AS**
  SELECT (AcctNo, AcctType, Balance, Branch) FROM Account
  WHERE Branch = "Ragama"
  WITH CHECK OPTION;

- **GRANT CREATE VIEW, CREATE TABLE TO X1;**
- **GRANT SELECT, INSERT ON Acct_view TO X1 WITH GRANT OPTION;**
- **GRANT SELECT, UPDATE(Balance) ON Acct_view TO X2 WITH GRANT OPTION;**

44) The users in the above scenario executed the following SQL statements respectively.

(I) X2:
```
CREATE VIEW  X2_view AS
        SELECT * FROM Acct_view;
```

(II) X1:
```
INSERT INTO Acct_view(101, 'Savings',50000, 'Kadawatha');
```

(III) X2:
```
GRANT UPDATE Account(Balance) TO X3;
```

Which of them executed successfully?

(a) (I) and (II) only (b) (II) and (III) only (c) (I) and (III) only
(d) (III) only (e) None

45) Then X1 and X2 executed the following SQL statements successfully.

```
X1: GRANT SELECT ON Acct_view TO X3;
X2: GRANT SELECT ON Acct_view TO X3;
```

After X1 revokes the select privilege from X3, which of the following SELECT statements will X3 execute successfully?

(I) X3:
```
SELECT * FROM Acct_view;
```

(II) X3:
```
SELECT Name, AcctNo, Balance
      FROM Acct_view a, Customer c
      WHERE a.Custid = c.Custid;
```

(III) X3:
```
SELECT AcctNo, Balance, AcctType,  Branch
       FROM Acct_view;
```

(a) (I) and (III) only

(b) (I) and (II) only

(c) X3 does not have enough permission to execute SELECT command on Acct_view

(d) (I) only

(e) All are correct

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