



**UNIVERSITY OF COLOMBO, SRI LANKA**

UNIVERSITY OF COLOMBO SCHOOL OF COMPUTING

**DEGREE OF BACHELOR OF INFORMATION TECHNOLOGY (EXTERNAL)**

*Academic Year 2019 – 1<sup>st</sup> Year Examination – Semester 2*

***IT2305 – Database Systems I***

***Multiple Choice Question Paper***

***3<sup>rd</sup> November, 2019***

***(TWO HOURS)***

**Important Instructions :**

- The duration of the paper is **2 (two) hours**.
- The medium of instruction and questions is English.
- The paper has **40 questions** and **22 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 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.**
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1) Which of the following statement(s) is/are correct regarding databases?

- (a) A collection of programs that enables users to manage data.
- (b) Logically related collection of data with some inherent meaning.
- (c) Represent some aspect of the real world/mini world, and changes to the mini world are reflected.
- (d) Processed, summarized and organized set of data.
- (e) A database schema is to represent data in a database at a particular moment in time.

2) Given below are the key phases that should be completed when designing a database for an application software.

- (I) Logical design of the database.
- (II) Physical design of the database.
- (III) Requirement specification and analysis.
- (IV) Conceptual design of the database.
- (V) Design and develop relevant interfaces.

What is the correct order of operations that should be followed?

- (a) (III) (I) (IV) (II) (V)
- (b) (III) (IV) (I) (II) (V)
- (c) (V) (III) (IV) (I) (II)
- (d) (V) (III) (I) (IV) (II)
- (e) (III) (V) (IV) (I) (II)

3) Which of the following is/are true with respect to ANSI/SPARC database architecture?

- (a) Storage space allocation for data and indexes are defined in the conceptual schema.
- (b) All entities, their attributes and relationships are defined in the conceptual schema.
- (c) Constraints on data are defined in the internal schema.
- (d) Security and integrity information is defined in the external schema.
- (e) Indexes are defined in the internal schema.

4) “Logical Data Independence” can be defined as;

- (a) Immunity of external schemas to changes in conceptual schemas.
- (b) Immunity of conceptual schemas to changes in internal schemas.
- (c) Immunity of conceptual schemas to changes in external schemas.
- (d) Immunity of internal schemas to changes in conceptual schemas.
- (e) Immunity of external schemas to changes in internal schemas.

5) Which of the following statement(s) is/are true regarding the actors on a database system?

- (a) Coordinating and monitoring of the database use is a responsibility of a System Analyst.
- (b) Acquiring relevant hardware and software resources is a responsibility of a Database Designer.
- (c) Authorizing access to the database is performed by a Database Administrator.
- (d) Identifying the data to be stored in the database, and choosing appropriate structures to represent and store data is performed by a Database Designer.
- (e) Communicating with all prospective database users to understand their requirements and defining database views is performed by a Database Designer.

6) Which of the following statement(s) is/are incorrect regarding database constraints?

- (a) A relation not being able to have any duplicate tuples, is an example of an inherent constraint.
- (b) Entity integrity constraints and referential integrity constraints are types of schema-based constraints.
- (c) Domain constraints specify that within each tuple, the value of each attribute  $A$  must be an atomic value from the domain  $\text{dom}(A)$ .
- (d) Referential integrity is used to maintain consistency among tuples in two relations.
- (e) Entity integrity constraint defines that there cannot be NULL values for any given attribute.

7) Which of the following rule(s) can be enforced on a database which represents a School domain, using referential integrity constraints in databases?

- (a) The “Name” field of the STUDENT table should contain only strings of no more than 30 alphabetic characters.
- (b) Information about the courses must be known before enrolling students to any course.
- (c) Every course record must have a unique value for Course\_Number.
- (d) TEACHER relation has a field called ‘Section’ which should contain values “Art, Science or Mathematics” only.
- (e) There should not be NULL values for Student name attribute.

8) Which of the following statement(s) is/are incorrect regarding keys in databases?

- (a) A single attribute or a set of attributes that uniquely identifies a tuple in a relation is called a super key.
- (b) A candidate key is a minimal set of attributes necessary to identify a relation.
- (c) A super key is always a candidate key whereas a candidate key sometimes becomes a super key.
- (d) A subset of super key is a candidate key in which no proper subset is a super key.
- (e) There can be many super keys and candidate keys in a relation.

**Consider the relation R(A, B, C, D, E, F) with the following dependencies to answer the question (9) and (10).**

$AB \rightarrow CDEF$   
 $CD \rightarrow AB EF$   
 $CB \rightarrow DF$   
 $ABD \rightarrow CEF$   
 $DF \rightarrow ABCE$   
 $DEF \rightarrow ABC$

9) Which of the following can be taken as (a) super key(s) of the relation R?

- |         |         |        |
|---------|---------|--------|
| (a) AB  | (b) CD  | (c) CB |
| (d) ABD | (e) DEF |        |

10) Which of the following can be taken as (a) candidate key(s) of the relation R?

(a) AB	(b) CD	(c) ABD
(d) DEF	(e) DF	

11) Which of the following statements is/are correct in relation to the database design process?

(a) In parallel with specifying the data requirements, it is useful to specify the known functional requirements of the application.
(b) The conceptual schema has the data requirements of the users along with storage and implementation details.
(c) Transformation of the high-level data model into the implementation data model is called logical design.
(d) Internal storage structures, file organizations, indexes, access paths, and physical design parameters for the database files are specified during logical design.
(e) The high-level conceptual schema can be used as a reference to ensure that all users' functional requirements are met and that the requirements do not conflict.

12) FK is a set of attributes in the relation schema R1 and acts as the foreign key of R1 that references the relation R2. Which of the following statement(s) is/are false?

(a) FK must always have at least two attributes.
(b) Every tuple of R1 has distinct values for FK.
(c) The attributes in FK have the same domain(s) as the primary key attribute PK of R2.
(d) The attributes FK are said to reference the relation R2.
(e) The attributes FK are said to reference the relation R1.

13) Which statements best describe the degrees of relationship (cardinality)?

- (a) The number of items in a relationship.
- (b) The number of items in an entity.
- (c) The minimum and the maximum number of relationship instances in which an entity can participate.
- (d) The number of entity sets which may be related to a given entity.
- (e) The distinctiveness of information values contained in a column.

14) Map the letters (A to E) in Table 1 with letters (F to K) in Table 2 that best describe them.

*Table 1*

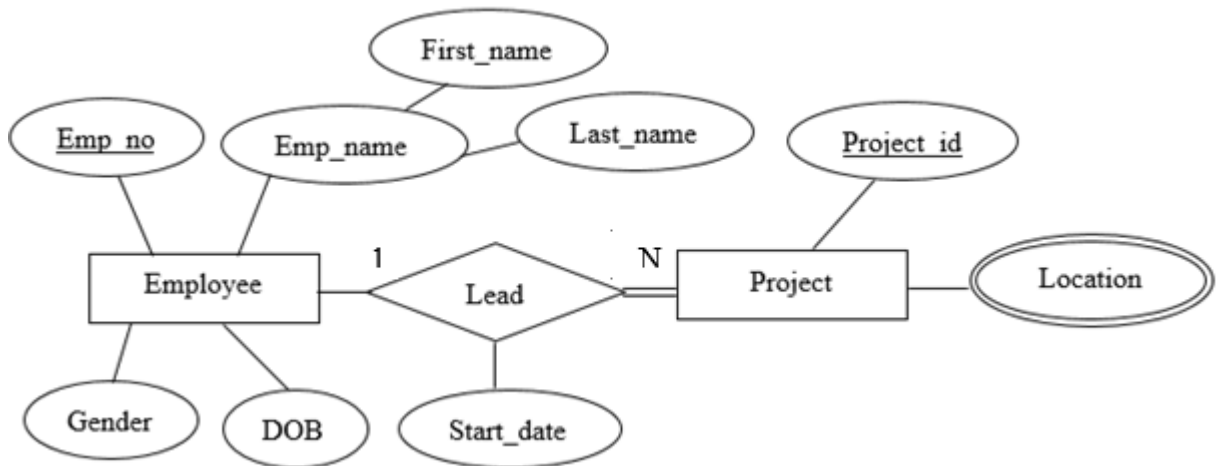
A	Strong Entity
B	Weak Entity
C	Composite attribute
D	Multivalued attribute
E	Derived attribute

*Table 2*

F	An attribute is one whose value is dynamic.
G	An entity that having a partial key which acts as a discriminator between the entities.
H	An attribute that can hold numerous values.
I	An attribute that is a combination of other attributes.
J	An entity that cannot be uniquely identified by its own attributes.
K	An entity whose existence does not depend on the existence of any other entity in a schema.

- (a)  $A \rightarrow J, B \rightarrow K, B \rightarrow G, C \rightarrow I, D \rightarrow H, E \rightarrow F$
- (b)  $A \rightarrow J, B \rightarrow K, B \rightarrow G, C \rightarrow H, D \rightarrow F, E \rightarrow I$
- (c)  $A \rightarrow K, B \rightarrow G, B \rightarrow J, C \rightarrow I, D \rightarrow H, E \rightarrow F$
- (d)  $A \rightarrow K, B \rightarrow G, B \rightarrow J, C \rightarrow I, D \rightarrow F, E \rightarrow I$
- (e)  $A \rightarrow G, A \rightarrow J, B \rightarrow K, C \rightarrow H, D \rightarrow F, E \rightarrow I$

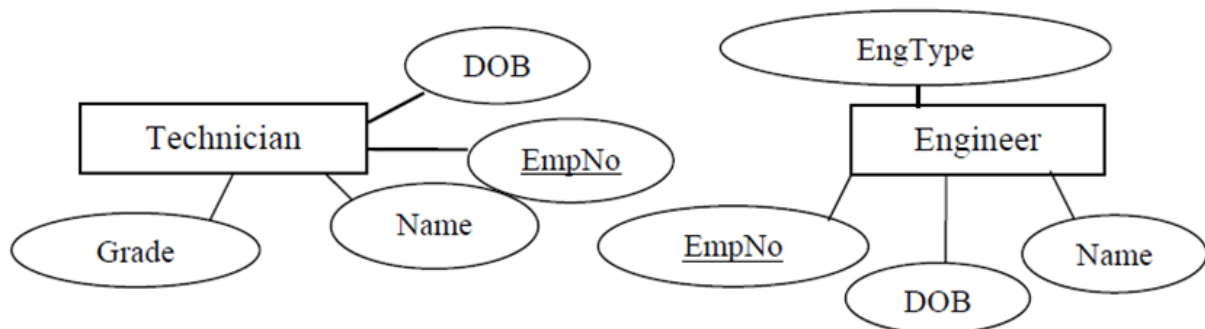
- 15) Consider the following ER diagram, which depicts the relationships between an employee and the projects she/he may lead.



It is required to map the ER diagram into the necessary relations. Which of the following should be the relations of the above ER diagram when mapped into the necessary relations?

- (a) Employee (Emp\_no, Gender, DOB, First\_name, Last\_name)
- (b) Employee (Emp\_no, Gender, DOB, First\_name, Last\_name, Project\_id)
- (c) Project (Project\_id, Leader, Start\_Date)
- (d) Project (Project\_id, Leader, Start\_Date, Location)
- (e) Lead (Emp\_no, Project\_id, Start\_Date)

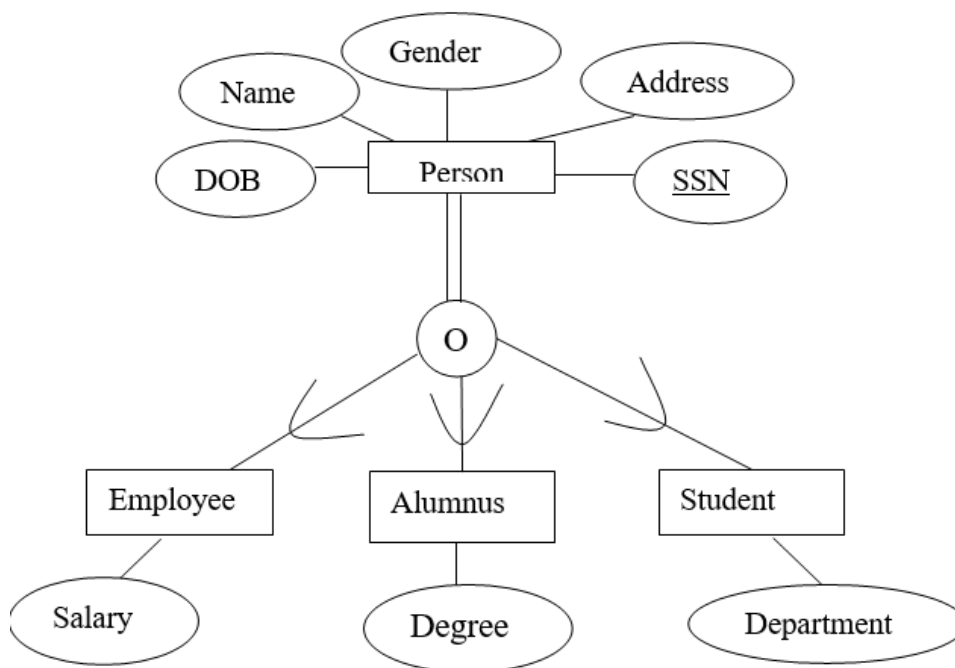
- 16) Consider the following two entities recognized at the analysis stage of an information system in an Engineering company.



If one generalizes these two entities by introducing an Employee entity, then which combination of the following best describe(s) the attributes relevant to the entities?

- (a) Technician: EmpNo, Name, Grade, DOB
- (b) Technician: EmpNo, Grade
- (c) Engineer: EmpNo, EngType
- (d) Engineer: EmpNo, DOB, Name, EngType
- (e) Employee: EmpNo, Name, DOB

- 17) Consider the following entity relationship diagram. Which statement(s) best describe(s) the information presented in the EER diagram below?



- (a) Alumnus is a generalization of Person.
- (b) There can be entities of Person type who are neither of the Employee type nor of the Alumnus or Student type.
- (c) There can be only one relation once the local conceptual model is mapped to the relational model.
- (d) The EER diagram shows an overlapping total participation constraint.
- (e) There can be separate relations for all the subclasses of Person type where the key for each relation is the SSN.

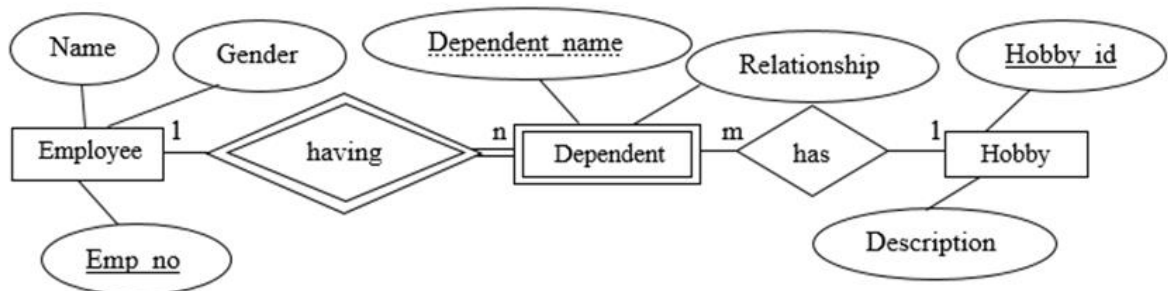


- 18) 'Suwa Setha' is a private hospital with a large number of employees. Each patient that comes to the hospital will meet at least one physician for treatment. Each physician may treat more than one patient during their working hours. Also, the hospital records the date and time of the treatment.

Which of the following is/are true in relation to the above description?

- (a) Three regular entities named Patient, Physician and Treatment can be identified.
- (b) Four regular entities named Hospital, Patient, Physician and Treatment can be identified.
- (c) Treatment is an associate entity having attributes related to the treatment done by whom and to which patient.
- (d) Relationship between Patient and Treatment is one to many and the relationship between Treatment and Physician is many to one.
- (e) The default primary key for the Treatment relation consists of the two primary key attributes from the other two relations.

- 19) Consider the following ER diagram.



What is/are the relation(s) one gets when the above ER diagram maps to the corresponding relation(s)?

- (a) Hobby (Hobby\_id, Description, Dependent\_name)
- (b) Hobby (Hobby\_id, Description)
- (c) Employee (Emp\_no, Name, Gender, Dependent\_name)
- (d) Dependent (Dependent\_name, Relationship, Emp\_no, Hobby\_id)
- (e) Dependent (Dependent\_name, Relationship, Emp\_no, Hobby\_id)

- 20) Consider the relation **MedicalTest(Doctor\_ID, Patient\_ID, Date, Test\_Code, Charge)** with the following functional dependencies.

**(Test\_Code) → (Charge)**

**(Doctor\_ID, Patient\_ID, Date) → (Test\_Code, Charge)**

Which of the following statement(s) is/are true?

- (a) The functional dependency (Test\_Code) → (Charge) violates 3NF.
- (b) The functional dependency (Test\_Code) → (Charge) is a transitive functional dependency.
- (c) The functional dependency (Doctor\_ID, Patient\_ID, Date) → (Test\_Code, Charge) is a partial functional dependency.
- (d) The best normal form that the relation MedicalTest satisfies is 2NF.
- (e) The best normal form that the relation MedicalTest satisfies is 1NF.

**When answering questions from (21) to (23), consider the following schema which keeps track of employees and the projects to which they are assigned. Primary keys are underlined and foreign keys are in *Italics*.**

Employee (eid, ename, address, salary, *dno*)

Department (dno, dname)

Project (pid, pname, client, duration, pm)

Assign (*eid*, *pid*, hours)

- 21) Which of the following relational algebra expressions would list the ID and the name of all the employees in department 4 who gets salary more than Rs.50000/=?

- (a)  $\pi_{eid,ename} ( \pi_{salary > 50000 \text{ AND } dno=4} (Employee))$
- (b)  $\pi_{eid,ename} ( \sigma_{salary > 50000 \text{ AND } dno=4} (Employee))$
- (c)  $\sigma_{eid,ename} ( \pi_{salary > 50000 \text{ AND } dno=4} (Employee))$
- (d)  $\pi_{eid,ename} ( \sigma_{salary > 50000} ( \sigma_{dno=4} (Employee)))$
- (e)  $\sigma_{salary > 50000 \text{ AND } dno=4} ( \pi_{eid,ename} (Employee))$

22) Consider the operations given below.

$$\begin{aligned} R1 &\leftarrow \pi_{\text{eid, pid}} (\sigma_{\text{hours} > 100} (\text{Assign})) \\ R2 &\leftarrow \pi_{\text{eid}} (\sigma_{\text{salary} < 20000} (\text{Employee})) \\ \text{Result} &\leftarrow R1 \cap R2 \end{aligned}$$

What would be the Result set if the above sequence of operations is applied?

- (a) Relation with two attributes eid and pid which gives all employees and their project id, who have worked more than 100 hours with salary less than 20000.
- (b) Relation with two attributes eid and pid which gives all employees and their project id, who have worked more than 100 hours or salary less than 20000.
- (c) Relation with only one attribute eid which gives all employees who have worked more than 100 hours with salary less than 20000.
- (d) Relation with three attributes eid, eid and pid which gives all employees who have worked more than 100 hours with salary less than 20000.
- (e) This operation is invalid and cannot be performed.

23) Which of the following sequence of operations would result in the names of employees who have not been assigned to any project?

- (a)  $R1 \leftarrow \pi_{\text{eid}} (\text{Assign})$   
 $R2 \leftarrow \pi_{\text{eid}} (\text{Employee})$   
 $R3 \leftarrow R1 - R2$   
 $\text{Result} \leftarrow \pi_{\text{ename}} (R3 \bowtie_{\text{eid}=\text{eid}} \text{Employee})$
- (b)  $R1 \leftarrow \pi_{\text{eid}} (\text{Assign})$   
 $R2 \leftarrow \pi_{\text{eid}} (\text{Employee})$   
 $R3 \leftarrow R2 - R1$   
 $\text{Result} \leftarrow \pi_{\text{ename}} (R3 \bowtie_{\text{eid}=\text{eid}} \text{Employee})$
- (c)  $R1 \leftarrow \pi_{\text{eid}} (\text{Assign})$   
 $R2 \leftarrow \pi_{\text{eid}} (\text{Employee})$   
 $R3 \leftarrow R2 - (R2 \cap R1)$   
 $\text{Result} \leftarrow \pi_{\text{ename}} (R3 \bowtie_{\text{eid}=\text{eid}} \text{Employee})$
- (d)  $R1 \leftarrow \pi_{\text{eid}} (\text{Assign})$   
 $R2 \leftarrow \pi_{\text{eid}} (\text{Employee})$   
 $R3 \leftarrow R2 - (R2 \cup R1)$   
 $\text{Result} \leftarrow \pi_{\text{ename}} (R3 \bowtie_{\text{eid}=\text{eid}} \text{Employee})$
- (e)  $R1 \leftarrow \pi_{\text{eid}} (\text{Employee} - \text{Assign})$   
 $\text{Result} \leftarrow \pi_{\text{ename}} (R1 \bowtie_{\text{eid}=\text{eid}} \text{Employee})$

- 24) Given below are two relations with the same schema definition. R and S have N and M numbers of tuples respectively.

R (A, B, C, D)  
S (E, F, G, H)

- (I)  $I \leftarrow R \times S$ ; I contains exactly 8 attributes and  $(N * M)$  number of tuples.  
(II)  $J \leftarrow R \cap S$ ; J contains less than M tuples exactly.  
(III)  $K \leftarrow R \cup S$ ; K should always contain  $(N+M)$  tuples.

Which of the above statement(s) is/are true?

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

- 25) Consider the following tasks and identify the SQL commands that should be used to accomplish each task.

- (I) Modify the existing records in a table.  
(II) Add columns to an existing table.  
(III) Delete existing records in a table.  
(IV) Delete a role defined in the database.

Which of the following correctly indicate the SQL command sequence required for each of the above tasks?

- |                                     |
|-------------------------------------|
| (a) ALTER, UPDATE, DELETE, DROP     |
| (b) UPDATE, ALTER, DELETE, DROP     |
| (c) UPDATE, ALTER, DROP, DELETE     |
| (d) UPDATE, ALTER, DELETE, TRUNCATE |
| (e) MODIFY, ALTER, DELETE, DROP     |

Consider the following two relations Employee and Department taken from a company database to answer questions (26) to (28).

Employee relation has E\_ID as the Primary key and Dept\_No as the foreign key from the Department relation.

**Employee**

<u>E_ID</u>	Name	Address	Designation	Dept_No	Salary
123456	Janith Perera	23, Hill side, Nuwara Eliya	Merchandizer	2	90000
123236	Sahan Bandara	Nawala, Rajagiriya	Manager	1	150000
123746	Sanduni Alwis	Saman Villa, Colombo 04	Clerk	3	60000
123886	Nimantha Silva	Thissa Road, Hambanthota	Manager	2	150000

**Department**

<u>Dnumber</u>	DName
1	Winter Wear
2	Sport Wear
3	Shoes

26)

Which of the following SQL statements will execute without any error?

- (a) INSERT INTO Employee VALUES (123526, 'Jeevantha Lenin', 'Lotus Road, Wellawaththa', 'Clerk', 4, 60000);
- (b) INSERT INTO Employee VALUES (123746, 'Nishadi Peiris', 'Lotus Avenue, Kiribathgoda', 'Intern', 3, 20000);
- (c) INSERT INTO Employee VALUES (123526, 'Jeevantha Lenin', 'Lotus Road, Wellawaththa', 'Clerk', NULL, 60000);
- (d) INSERT INTO Employee VALUES (123346, 'Lotus Avenue, Kiribathgoda', 'Nishadi Peiris', 'Intern', 3, 20000);
- (e) INSERT INTO Employee VALUES (NULL, 'Jeevantha Lenin', 'Lotus Road, Wellawaththa', 'Clerk', 4, 60000);

- 27) Assume that the management of the company decided to give a 'Festive\_Bonus' during the month of April.

$$\text{Festive\_Bonus} = \text{Salary} + \text{Salary} * 0.5$$

Which of the following SQL statements can be used to list down the name and the Festive\_Bonus given for each employee?

- (a) SELECT Name, Salary + Salary\*0.5 AS Festive\_Bonus FROM Employee;
- (b) SELECT Name, Festive\_Bonus AS Salary + Salary\*0.5 FROM Employee;
- (c) CREATE Festive\_Bonus = Salary + Salary\*0.5 FROM Employee; SELECT Name, Festive\_Bonus FROM Employee;
- (d) SELECT Name, Festive\_Bonus = Salary + Salary\*0.5 FROM Employee;
- (e) SELECT Name, Festive\_Bonus FROM Employee WHERE Festive\_Bonus = Salary + Salary\*0.5;

- 28) Assume that you want to retrieve the names of the employees as well as the department name of all employees who have been assigned to a department. Which of the following SQL statements will produce the correct result?

- (I) SELECT Name, DName FROM Employee e LEFT OUTER JOIN Department d ON (e.Dept\_No = d.Dnumber);
- (II) SELECT Name, DName FROM Employee e RIGHT OUTER JOIN Department d WHERE (e.Dept\_No = d.Dnumber);
- (III) SELECT Name, DName FROM Employee e NATURAL JOIN Department d ON (e.Dept\_No = d.DNumber);

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

Given below is a set of relation schemas taken from a University database. Answer questions (29) and (30) using them.

Student (Student\_ID, S\_Name, Level)  
Course (Course\_ID, C\_Name, Credits)  
Enroll (Std\_ID, C\_ID, Mark, Grade)

- 29) Which of the following SQL statements will return all the names of students who have obtained below 40 marks for the course IT2305 in ascending order on S\_Name?

- (a) SELECT S\_Name FROM Student WHERE Student\_ID IN (SELECT Std\_ID FROM Enroll WHERE C\_ID = 'IT2305' AND Mark <40) ORDER BY S\_Name ASC;
- (b) SELECT S\_Name FROM Student s, Enroll e where s.Student\_ID = e.Std\_ID AND C\_ID= 'IT2305' AND Mark<40 ORDER BY S\_Name ASC;
- (c) SELECT S\_Name FROM Student s, Enroll e where s.Student\_ID = e.Std\_ID AND C\_ID='IT2305' AND Mark<40 ORDER BY S\_Name;
- (d) SELECT S\_Name FROM Student s, Enroll e where s.Student\_ID = e.Std\_ID AND C\_ID='IT2305' AND Mark<40 ASC;
- (e) SELECT S\_Name IN ASC FROM Student s, Enroll e where s.Student\_ID = e.Std\_ID AND C\_ID='IT2305' AND Mark<40;

- 30) Which of the following SQL statements will list down all the course IDs for which the average mark is less than 50?

- (a) SELECT C\_ID, AVG(Mark) FROM Enroll ORDER BY C\_ID HAVING AVG(Mark)<50;
- (b) SELECT C\_ID, AVG(Mark) FROM Enroll GROUP BY C\_ID HAVING AVG(Mark)<50;
- (c) SELECT C\_ID, AVG(Mark) FROM Enroll HAVING AVG(Mark)<50;
- (d) SELECT C\_ID, AVG(Mark) FROM Enroll WHERE AVG(Mark)<50;
- (e) SELECT C\_ID, AVG(Mark) WHERE AVG(MARK) <50 FROM Enroll;

Given below is a set of relations taken from a database of a bookselling company. Answer questions (31) to (35) using them.

A Book can be uniquely identified by Book\_ID, Branch by Branch\_Name and Category by Category\_ID. Book\_Availability has a composite primary key (Book\_ID, Branch\_Name). When inserting data to the Book\_Availability table, the minimum number of copies allowed should be 10.

#### Books

<u>Book_ID</u>	ISBN	Name	Author	Publisher	Cat_ID	Price
111	8865-4-1899	Programming in C	Stephen Kochin	Perasons	4	2540
112	7345-2-7684	Adisi Nadiya	Kapila Kumara	Godage	3	950
113	2312-5-3898	Ceylon in 1818	Ariyasena Vithana	Sooriya	1	2500
114	4356-7-8976	Budu Maga	Wijayathilake	Sarasavi	2	240
115	6723-6-1234	Mahindagamanaya	Nimal Tennakoon	Godage	2	980
116	7626-4-8765	Makaraksha	Saman Uduge	Sarasavi	3	1250

#### Branches

<u>Branch_Name</u>	Location
Sarasavi Arcade	Colombo
Sarasavi City Center	Kandy
Sarasavi Opal	Galle

#### Book\_Availability

<u>Book_ID</u>	<u>Branch_Name</u>	Copies
111	Sarasavi Arcade	13
111	Sarasavi City Center	14
111	Sarasavi Opal	12
114	Sarasavi Arcade	30
112	Sarasavi City Center	43
112	Sarasavi Arcade	58
113	Sarasavi Opal	16
113	Sarasavi Arcade	11

#### Category

<u>Category_ID</u>	Name
1	History
2	Religious
3	Novels
4	Educational



31) Which of the following SQL statements will create the Book\_Availability table correctly with all constraints?

- (a) CREATE Book\_Availability (Book\_ID INT, Branch\_Name VARCHAR (30), Copies INT CHECK (Copies >= 10), PRIMARY KEY (Book\_ID, Branch\_Name));
- (b) CREATE TABLE Book\_Availability (Book\_ID INT, Branch\_Name VARCHAR (30), Copies INT CHECK (Copies >= 10), PRIMARY KEY (Book\_ID, Branch\_Name));
- (c) CREATE TABLE Book\_Availability (INT Book\_ID, VARCHAR (30) Branch\_Name, INT Copies CHECK (Copies >= 10), PRIMARY KEY (Book\_ID, Branch\_Name));
- (d) CREATE TABLE Book\_Availability (Book\_ID INT, Branch\_Name VARCHAR (30), Copies INT CHECK (Copies >= 10));  
UPDATE TABLE Book\_Availability ADD PRIMARY KEY (Book\_ID, Branch\_Name);
- (e) CREATE TABLE Book\_Availability (Book\_ID INT, Branch\_Name VARCHAR (30), Copies INT CHECK (Copies >= 10));  
ALTER TABLE Book\_Availability ADD CONSTRAINT Pk\_Const PRIMARY KEY (Book\_ID, Branch\_Name);

32) Which of the following SQL statements correctly defines the Foreign Key constraints of the Book\_Availability table?

- (a) ALTER TABLE Book\_Availability ADD CONSTRAINT book\_fk FOREIGN KEY (BOOK\_ID) REFERENCES Books (Book\_ID), branch\_fk FOREIGN KEY (Branch\_Name) REFERENCES Branches (Branch\_Name);
- (b) ALTER TABLE Book\_Availability ADD CONSTRAINT book\_fk FOREIGN KEY (BOOK\_ID) REFERENCES Books (Book\_ID);  
  
ALTER TABLE Book\_Availability ADD CONSTRAINT branch\_fk FOREIGN KEY (Branch\_Name) REFERENCES Branches (Branch\_Name);
- (c) ALTER TABLE Book\_Availability ADD FOREIGN KEY (BOOK\_ID) REFERENCES Books (Book\_ID);  
  
ALTER TABLE Book\_Availability ADD FOREIGN KEY (Branch\_Name) REFERENCES Branches (Branch\_Name);
- (d) UPDATE TABLE Book\_Availability ADD CONSTRAINT book\_fk FOREIGN KEY (BOOK\_ID) REFERENCES Books (Book\_ID), ADD CONSTRAINT branch\_fk FOREIGN KEY (Branch\_Name) REFERENCES Branches (Branch\_Name);

(e) ALTER TABLE Book\_Availability ADD CONSTRAINT book\_fk, branch\_fk FOREIGN KEY (BOOK\_ID, Branch\_Name) REFERENCES Books (Book\_ID) AND Branches (Branch\_Name);

- 33) Suppose we want to find out the Book\_IDs and Names of all the Books which are currently not available in any of the branches. Which of the following queries will return the correct result?

(a) SELECT b.Book\_ID, b.Name FROM Books b, Book\_Availability a WHERE b.Book\_ID NOT IN (SELECT a.Book\_ID FROM a);

(b) SELECT b.Book\_ID, b.Name FROM Books b WHERE b.Book\_ID NOT IN (SELECT a.Book\_ID FROM Book\_Availability a);

(c) RETRIEVE b.Book\_ID, b.Name FROM Books b, Book\_Availability a WHERE b.Book\_ID NOT IN (SELECT a.Book\_ID FROM Book\_Availability);

(d) SELECT b.Book\_ID, b.Name FROM Books b WHERE b.Book\_ID <> ALL (SELECT a.Book\_ID FROM Book\_Availability a where b.book\_ID=a.book\_ID);

(e) RETRIEVE b.Book\_ID, b.Name FROM Books b, Book\_Availability a WHERE b.Book\_ID <> a.book\_ID;

- 34) Suppose we want to find out the Book\_IDs and Names of all the Books which have less than 15 copies available in 'Sarasavi Arcade' or 'Sarasavi Opal'. Consider the following SQL statements.

(I) SELECT Book\_ID , Name from Books where Book\_ID EXISTS (SELECT Book\_ID FROM Book\_Availability WHERE (Branch\_Name='Sarasavi Arcade' OR Branch\_Name ='Sarasavi Opal' AND Copies<15));

(II) SELECT Book\_ID , Name from Books where Book\_ID IN (SELECT Book\_ID FROM Book\_Availability WHERE ((Branch\_Name=' Sarasavi Arcade' OR Branch\_Name ='Sarasavi Opal' ) AND Copies<15));

(III) SELECT Book\_ID , Name from Books where Book\_ID IN (SELECT Book\_ID FROM Book\_Availability WHERE (Branch\_Name=' Sarasavi Arcade' AND Copies<15 OR Branch\_Name ='Sarasavi Opal' AND Copies<15));

(IV) SELECT b.Book\_ID , b.Name from Books b, Book\_Availability a WHERE b.Book\_ID = a.Book\_ID AND ((Branch\_Name='Arcade' AND Copies<15) OR (Branch\_Name ='Sarasavi Opal'AND Copies<15 ));

Which of the above queries will return the correct result?

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

35) The following sequence of SQL statements were issued in the given order. Assume that only the correct statements get executed.

- (I) INSERT INTO Book\_Availability VALUES (111, 'Sarasavi Arcade', 20);
- (II) UPDATE Book\_Availability SET Copies=80 WHERE Book\_ID=113;
- (III) INSERT INTO Book\_Availability VALUES (116, 'Sarasavi Arcade', 8);
- (IV) INSERT INTO Book\_Availability VALUES (117, 'Sarasavi Arcade', 50);
- (V) DELETE FROM Book\_Availability WHERE Book\_ID=114;

What would be the result if the following SQL query is executed subsequently?

SELECT SUM(Copies) from Book\_Availability WHERE Branch\_Name= 'Sarasavi Arcade';

- |         |         |         |
|---------|---------|---------|
| (a) 216 | (b) 208 | (c) 158 |
| (d) 151 | (e) 221 |         |

36) Which of the following statements is/are always true regarding Database Views?

- (a) A view can be created as read only.
- (b) A view can be created as a join on two or more tables.
- (c) A view cannot have a GROUP BY clause in the SELECT statement.
- (d) A view cannot be updated once created.
- (e) A view may be a subset of the database or it may contain virtual data that is derived from the database files but is not explicitly stored.

Consider the following relation schemas taken from a UniversityAcademics database to answer questions (37) and (38)

Staff(S\_ID, Name, Designation)

Publications(P\_ID, Conference\_ID, Year, Staff\_ID, Supervisor\_ID)

Only three designation categories are available namely: 'Lecturer', 'Senior\_Lecturer', and 'Professor'. Supervisor must be a staff member from category 'Senior\_Lecturer' or 'Professor'. In the Publications relation, Supervisor\_ID is the S\_ID of the supervisor. And each record represents exactly one publication.

- 37) A view called 'PublicationSummary' needs to be created to summarize the total number of publications for each 'Lecturer'.

- (I) CREATE VIEW PublicationSummary AS SELECT Staff\_ID, COUNT(\*) AS Tot\_Published FROM Publications WHERE Designation='Lecturer' GROUP BY Staff\_ID;
- (II) CREATE VIEW PublicationSummary AS SELECT S\_ID, COUNT(\*) AS Tot\_Published FROM Staff, Publications WHERE S\_ID=Staff\_ID AND Designation = 'Lecturer' GROUP BY S\_ID;
- (III) CREATE VIEW PublicationSummary (Lect\_ID, No\_of\_Publications) AS SELECT S\_ID, COUNT(\*) FROM Staff, Publications WHERE S\_ID=Staff\_ID AND Designation = 'Lecturer';

Which of the above SQL statements will generate the correct result set?

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

- 38) The Academic Head of the University wants to identify all the 'Lecturers' who have more than 10 publications. It is required to create a view called 'Top\_Junior\_Publishers'.

- (I) CREATE VIEW Top\_Junior\_Publisher AS SELECT Staff\_ID, COUNT(\*) AS Tot\_Published FROM Publications WHERE Designation='Lecturer' GROUP BY Staff\_ID HAVING Tot\_Published >10;
- (II) CREATE VIEW PublicationSummary AS SELECT S\_ID, COUNT(\*) AS Tot\_Published FROM Staff, Publications WHERE S\_ID=Staff\_ID AND Designation = 'Lecturer' GROUP BY S\_ID HAVING Tot\_Published >10;
- (III) CREATE VIEW PublicationSummary (Lect\_ID, No\_of\_Publications) AS SELECT S\_ID, COUNT(\*) FROM Staff, Publications WHERE S\_ID=Staff\_ID AND Designation = 'Lecturer' AND Tot\_Published >10;

Which of the above SQL statements will generate the correct result set?

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

**Consider the following scenario to answer questions (39) and (40).**

A Database Administrator who manages a database of a University created 3 new users namely Vidura, Chathura and Sithira. Given below is a relation taken from the database and a view created.

AdminStaff (emp\_id, name, address, telephone, joined\_date, department, salary)

CREATE VIEW basicInfo AS SELECT emp\_id, name, department FROM AdminStaff;

The following SQL commands were issued to grant privileges to the newly added users.

GRANT CREATE TABLE, CREATE VIEW TO Vidura;  
GRANT SELECT, INSERT ON basicInfo TO Chathura;  
GRANT SELECT, UPDATE (address, telephone) ON AdminStaff TO Sithira WITH  
GRANT OPTION;

39) Consider the following SQL commands issued by each user.

- (I) Chathura: SELECT emp\_id, name FROM basicInfo WHERE department = 5;
- (II) Sithira: UPDATE AdminStaff SET department=5 WHERE emp\_id=123;
- (III) Sithira: GRANT UPDATE ON AdminStaff TO Chathura;
- (IV) Vidura: CREATE TABLE Publications (P\_ID INT, Conf VARCHAR(10), Year INT, Staff\_ID INT);  
  
GRANT ALL PRIVILEGES ON Publications TO Sithira, Chathura  
WITH GRANT OPTION;

Which of the above SQL commands will execute successfully?

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

40) Vidura issues the following commands:

- (I) CREATE TABLE Staff (S\_ID INT PRIMARY KEY, SName VARCHAR (20), Designation VARCHAR (20), Salary INT);
- (II) CREATE VIEW Senior\_Staff AS SELECT \* FROM Staff WHERE Designation LIKE '%Senior%' WITH CHECK OPTION;
- (III) INSERT INTO Senior\_Staff (S\_ID, SName, Designation, Salary) VALUES (185,'Mihiri','Lecturer', 80000);
- (IV) INSERT INTO Senior\_Staff (S\_ID, SName, Designation, Salary) VALUES (201,'Dias','Senior Professor', 280000);

Which of them are valid and will get executed without any error?

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

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