



UNIVERSITY OF COLOMBO, SRI LANKA

UNIVERSITY OF COLOMBO SCHOOL OF COMPUTING

DEGREE OF BACHELOR OF INFORMATION TECHNOLOGY (EXTERNAL)

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IT2303 : Database Systems I

***9th August, 2009
(TWO HOURS)***

Important Instructions :

- The duration of the paper is **2 (two) hours**.
- The medium of instruction and questions is English.
- The paper has **45** questions and **14** 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) One type of database users would be practitioners. Which statements is/are true regarding practitioners?

- (a) They are the stakeholders of the database.
- (b) The external schema is created to fulfil the requirements of each practitioner.
- (c) Executives and managers are practitioners.
- (d) They are responsible for the performance of the database.
- (e) They provide security mechanisms to prevent unauthorized access to the database.

- 2) With respect to the ANSI/SPARC architecture, any given database has

- (a) more than one conceptual schema.
- (b) several external schemas.
- (c) several physical schemas.
- (d) exactly one conceptual schema.
- (e) exactly one external schema.

- 3) Logical data independence is

- (a) making changes at the physical level without affecting the conceptual level.
- (b) making changes at the conceptual level without affecting the physical level.
- (c) making changes at the external level without affecting the conceptual level.
- (d) making changes at the conceptual level without affecting the external level.
- (e) making changes at the physical level without affecting the external level.

- 4) A specific example where physical data independence would hold is when

- (a) an attribute is added to a relation.
- (b) a view is created for a particular user.
- (c) a data file is changed from a heap file to sorted file.
- (d) a constraint imposed on a relation is changed.
- (e) an additional access structure (e.g. index) is created to improve the performance of the data retrieval.

- 5) Which of the following statement(s) is/are correct with respect to DBMS languages?

- (a) DDL provides operators to manipulate data.
- (b) DML provides operators to retrieve data.
- (c) Declarative DML has to specify which data is to be retrieved and how to retrieve it.
- (d) Declarative DML has to specify which data is to be retrieved rather than how to retrieve it.
- (e) SQL is a declarative DML.

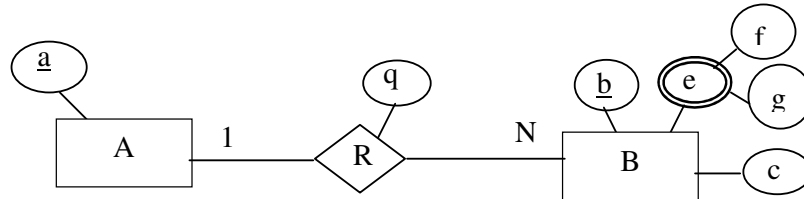
- 6) Which of the following constraints is/are inherent model based constraints with respect to the relational model?

- (a) Primary key cannot be null (Entity integrity).
- (b) Each attribute value should be atomic (atomic attribute values).
- (c) Primary key should be unique (Key constraint).
- (d) Attribute values should be drawn from a particular domain (Domain constraint).
- (e) When one relation refers to another relation, it should refer to an existing tuple (Referential integrity).

7) Which of the following is/are true with respect to the database design process?

- (a) Conceptual design is data model dependent.
- (b) Physical design is DBMS – independent.
- (c) Logical design is DBMS – dependent.
- (d) Physical design is DBMS – dependent.
- (e) Conceptual design is data model independent.

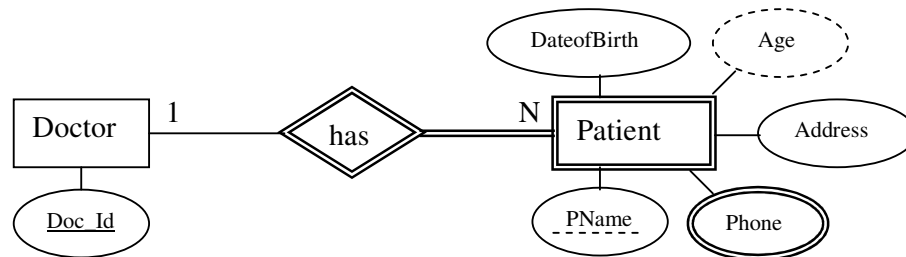
8) Consider the following ER diagram.



What would you get when entity B is mapped to the corresponding relation(s), where B_E is a possible representation for attribute e of entity B?

- (a) B(b, c, f, g, a)
- (b) B(b, c, e, a, q)
- (c) B(b, c, a, q)
- (d) B_E(b, e, a)
- (e) B_E(b, f, g)

9) Consider the following ER diagram.



What would you get when Patient in the above ER diagram maps to the corresponding relation(s)?

- (a) Patient(Doc_Id, PName, Phone, DateofBirth, Address, Age, Phone) only.
- (b) Patient(Doc_Id, PName, DateofBirth, Age, Address) and P_Phone(PName, Phone).
- (c) Patient(Doc_Id, PName, DateofBirth, Address) and P_Phone(Doc_Id, PName, Phone).
- (d) Patient(Doc_Id, PName, DateofBirth, Age, Address) and P_Phone(Doc_Id, PName, Phone).
- (e) Patient(Doc_Id, PName, DateofBirth, Address) and P_Phone(PName, Phone).

Consider the following scenario to answer the question from (10) – (13)

Pharmaceutical companies produce drugs and the trade name identifies each drug uniquely with respect to each company. Each pharmacy sells several drugs and has a price for each. A drug could be sold at several pharmacies at a fixed price. A pharmaceutical company can contract with several pharmacies, and a pharmacy can contract with several pharmaceutical companies. For each contract, it is necessary to store a start date, an end date and the text of the contract.

10) In the corresponding conceptual database model, how could the contract be represented?

- (a) As a weak entity and pharmaceutical company as its owner
- (b) As a weak entity and pharmacy as its owner
- (c) As a relationship between pharmacy and pharmaceutical company
- (d) As an associative entity between pharmacy and pharmaceutical company
- (e) As a composite attribute of the relationship between pharmacy and pharmaceutical company

11) Based on the given scenario, how would the price be represented?

- (a) As an attribute of pharmacy
- (b) As an attribute of the relationship between pharmacy and drug
- (c) As an attribute of the relationship between pharmacy and drug
- (d) As an attribute of drug
- (e) As an attribute of Pharmaceutical company

12) If the price of each drug could vary from one pharmacy to another, how would the price be represented?

- (a) As an attribute of drug
- (b) As an attribute of the relationship between pharmacy and drug
- (c) As an attribute of the relationship between pharmacy and Pharmaceutical company
- (d) As an attribute of pharmacy
- (e) As an attribute of Pharmaceutical company

13) Based on the given scenario if it is necessary to maintain the price history of each drug along with the effective date of each price, which of the following statement(s) is/are correct?

- (a) Effective date will get added as an attribute of pharmaceutical company.
- (b) Effective date will get added as a multivalued attribute of drug.
- (c) Price history will be maintained as a composite attribute of pharmaceutical company with the component attributes price and effective date.
- (d) Price history will be maintained as a multivalued composite attribute of drug with the component attributes price and effective date.
- (e) Price history could be represented as a weak entity with attributes price and effective date with drug as its owner entity.

14) Which of the following sets of operations represent the operations defined specifically for relational databases?

- (a) Union, intersection and set difference
- (b) Set Difference and Cartesian Product
- (c) Union and Cartesian Product
- (d) Selection, Projection and Join
- (e) Selection, Projection and Cartesian Product

Consider the following university schema to answer the questions from (15) to (22). Primary Keys are underlined and Foreign Keys are in italics. Lecturers can teach courses offered by other departments as well.

Lecturer (EmpNo, Name, Gender, Salary, Category, *DNo*).
 Department (DNo, Dname, *HeadEmpNo*) Course(CNo, Cname, Credits, *DNo*)
 Deliver(EmpNo, CNo, Hours) Research_Fund(RFName, *EmpNo*, Budget)

Relational operators used are Project (π), Select (σ), Natural Join (\bowtie), Right Outer Join (\bowtie_r), Left Outer Join (\bowtie_l), Union (U), Intersection (\cap), Set difference ($-$) and Divide (\div).

15) Consider the sequence of operations given below on the above relations.

- (i) RESULT1 $\leftarrow \pi_{CNo} (\sigma_{DNo=3} (Course))$
- (ii) RESULT2 $\leftarrow Deliver \div RESULT1$
- (iii) RESULT $\leftarrow \pi_{Name} (RESULT2 \bowtie_{EmpNo=EmpNo} Lecturer)$

What will the above sequence of operations performed on the given relations produce?

- (a) Find the names of Lecturers who are working for department No.3 and all the courses delivered by them.
- (b) Find the names of Lecturers who are delivering any course offered by department No.3.
- (c) Find the names of Lecturers who are not delivering any course offered by department No.3.
- (d) Find the names of Lecturers who are delivering all the courses offered by department No. 3.
- (e) Find the names of Lecturers who are delivering only the courses offered by department No.3.

16) Which of the following sequence of operations would list the names of department heads who have at least one research fund?

- (a) HEADS(EmpNo) $\leftarrow \pi_{HeadEmpNo}(Department)$
 RESULT1 $\leftarrow \pi_{EmpNo}(Research_Fund)$
 RESULT2 $\leftarrow RESULT1 \cap HEADS$
 RESULT $\leftarrow \pi_{Name}(RESULT2 \bowtie_{EmpNo=EmpNo} Lecturer)$
- (b) HEADS(EmpNo) $\leftarrow \pi_{HeadEmpNo}(Department)$
 RESULT1 $\leftarrow \pi_{EmpNo} (Research_Fund)$
 RESULT2 $\leftarrow RESULT1 \cup HEADS$
 RESULT $\leftarrow \pi_{Name}(RESULT2 \bowtie_{EmpNo=EmpNo} Lecturer)$
- (c) HEADS(EmpNo) $\leftarrow \pi_{HeadEmpNo}(Department \bowtie_{EmpNo=EmpNo} Research_Fund)$
 RESULT $\leftarrow \pi_{Name}(HEADS \bowtie_{EmpNo=EmpNo} Lecturer)$
- (d) HEADS(EmpNo) $\leftarrow \pi_{HeadEmpNo}(Department)$
 RESULT1 $\leftarrow \pi_{EmpNo} (Research_Fund)$
 RESULT2 $\leftarrow RESULT1 - HEADS$
 RESULT $\leftarrow \pi_{Name}(RESULT2 \bowtie_{EmpNo=EmpNo} Lecturer)$
- (e) HEADS(EmpNo) $\leftarrow \pi_{HeadEmpNo} (Department)$
 RESULT1 $\leftarrow \pi_{EmpNo}(Research_Fund)$
 RESULT2 $\leftarrow RESULT1 \bowtie_{EmpNo=HeadEmpNo} HEADS$
 RESULT $\leftarrow \pi_{Name}(RESULT2 \bowtie_{EmpNo=EmpNo} Lecturer)$

- 17) List the EmpNo, Name and Category of all the lecturers and the department name of all heads of the department. Which of the following sequence of operations would perform that?

- (a) $\pi_{\text{EmpNo, Name, Category, Dname}}(\text{Lecturer} \bowtie_{\text{EmpNo=HeadEmpNo}} \text{Department})$
 (b) $\pi_{\text{EmpNo, Name, Category, Dname}}(\text{Lecturer} \bowtie_{\text{DNo=DNo}} \text{Department})$
 (c) $\pi_{\text{EmpNo, Name, Category, Dname}}(\text{Lecturer} \bowtie_{\text{EmpNo=HeadEmpNo}} \text{Department})$
 (d) $\pi_{\text{EmpNo, Name, Category, Dname}}(\text{Lecturer} \bowtie_{\text{EmpNo=HeadEmpNo}} \text{Department})$
 (e) $\pi_{\text{EmpNo, Name, Category, Dname}}(\text{Lecturer} \bowtie_{\text{DNo=DNo}} \text{Department})$

- 18) Which of the following sequence of operations would find the names of lecturers who have no research fund?

- (a) $\text{RES1} \leftarrow \pi_{\text{EmpNo}}(\text{Research_Fund})$
 $\text{RESULT} \leftarrow \pi_{\text{Name}}(\text{Lecturer} - \text{RES1})$
 (b) $\text{RES1} \leftarrow \pi_{\text{EmpNo, Name}}(\text{Lecturer})$
 $\text{RES2} \leftarrow \pi_{\text{EmpNo}}(\text{Research_Fund})$
 $\text{RESULT} \leftarrow (\text{RES1} - \text{RES2})$
 (c) $\text{RES1} \leftarrow \pi_{\text{EmpNo, Name}}(\text{Lecturer})$
 $\text{RES2} \leftarrow \pi_{\text{EmpNo}}(\text{Research_Fund})$
 $\text{RESULT} \leftarrow (\text{RES1} \div \text{RES2})$
 (d) $\text{RES1} \leftarrow \pi_{\text{EmpNo}}(\text{Lecturer})$
 $\text{RES2} \leftarrow \pi_{\text{EmpNo}}(\text{Research_Fund})$
 $\text{RES3} \leftarrow (\text{RES1} - \text{RES2})$
 $\text{RESULT} \leftarrow \pi_{\text{Name}}(\text{RES3} * \text{Lecturer})$
 (e) $\text{RES1} \leftarrow \pi_{\text{EmpNo}}(\text{Research_Fund})$
 $\text{RES2} \leftarrow \pi_{\text{EmpNo}}(\text{Lecturer})$
 $\text{RES3} \leftarrow (\text{RES1} - \text{RES2})$
 $\text{RESULT} \leftarrow \pi_{\text{Name}}(\text{RES3} * \text{Lecturer})$

- 19) Two queries given in (I) and (II) below were written to achieve the following:

For each department that has more than five lecturers retrieve the department name and the number of its lecturers who are earning a salary more than Rs.40,000.

- (I) `SELECT D.Dname, COUNT(*)
 FROM Department D, Lecturer L
 WHERE D.DNo = L.DNo AND L.Salary > 40000
 GROUP BY D.Dname
 HAVING COUNT(*) > 5 ;`
 (II) `SELECT D.Dname, COUNT(*)
 FROM Department D, Lecturer L
 WHERE D.DNo = L.DNo AND L.Salary > 40000 AND L.DNo IN
 (SELECT DNo FROM Lecturer GROUP BY DNo HAVING COUNT(*) > 5)
 GROUP BY D.Dname;`

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

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

- 20) It is necessary to create a view called **Head_Funds** to display the EmpNo, Name, Salary and the No_of_RFunds (Research Funds) of the department heads who control more than one research fund. Which of the following statements would achieve it?

- (a) CREATE VIEW Head_Funds (EmpNo, Name, Salary, No_of_RFunds) AS
SELECT L.EmpNo, L.Name, L.Salary, COUNT(*)
FROM Lecturer L, Department D, Research_Fund R
WHERE L.EmpNo = D.HeadEmpNo AND L.EmpNo = R.EmpNo
GROUP BY L.EmpNo, L.Name, L.Salary
HAVING COUNT(*) >1 ;

(b) CREATE VIEW Head_Funds (EmpNo, Name, Salary, No_of_RFunds) AS
SELECT L.EmpNo, L.Name, L.Salary, COUNT(RFName)
FROM Lecturer L, Department D, Research_Fund R
WHERE L.EmpNo = D.HeadEmpNo AND L.EmpNo = R.EmpNo AND
COUNT(RFName) >1
GROUP BY L.EmpNo, L.Name, L.Salary;

(c) CREATE VIEW Head_Funds (EmpNo, Name, Salary, No_of_RFunds) AS
SELECT L.EmpNo, L.Name, L.Salary, COUNT(*)
FROM Lecturer L, Department D, Research_Fund R
WHERE L.EmpNo = D.HeadEmpNo AND L.EmpNo = R.EmpNo
GROUP BY L.EmpNo
HAVING COUNT(*) >1 ;

(d) CREATE VIEW Head_Funds AS
SELECT L.EmpNo, L.Name, L.Salary, COUNT(RFName) AS No_of_RFunds
FROM Lecturer L, Research_Fund R
WHERE L.EmpNo = R.EmpNo AND
L.EmpNo IN (SELECT D.HeadEmpNo FROM Department D)
GROUP BY L.EmpNo, L.Name, L.Salary
HAVING COUNT(RFName) >1 ;

(e) CREATE VIEW Head_Funds AS
SELECT L.EmpNo, L.Name, L.Salary, COUNT(*) AS No_of_RFunds
FROM Lecturer L, Department D, Research_Fund R
WHERE L.EmpNo = D.HeadEmpNo AND L.EmpNo = R.EmpNo
GROUP BY L.EmpNo, L.Name, L.Salary
HAVING COUNT(*) >1 ;

- 21) One tries to execute the following SQL statements on the **Head_Funds** view created in question (20) above.

- (i) SELECT COUNT(No_of_RFunds) FROM Head_Funds;
(ii) SELECT * FROM Head_Funds WHERE No_of_RFunds >2;
(iii) CREATE VIEW Head_Fund1 AS
SELECT EmpNo, Salary, No_of_RFunds
FROM Head_Funds WHERE Salary >50000;

Which of the following statements is/are true?

- (a) Only (i) can be executed on Head_Funds view.
(b) Only (ii) can be executed on Head_Funds view.
(c) Only (ii) & (iii) can be executed on Head_Funds view.
(d) Only (iii) can be executed on Head_Funds view.
(e) None of the above statements can be executed on Head_Funds view.

- 22) Which SQL statement would display the EmpNo and Names of all lecturers along with the total sum of the research funds (*TotalFund*) if a lecturer controls some research fund? Otherwise *TotalFund* should be kept blank or NULL.

- (a) SELECT L.EmpNo, L.Name, SUM(F.Budget) AS TotalFund
FROM Lecturer AS L RIGHT OUTER JOIN Research_Fund
AS F ON L.EmpNo = F.EmpNo GROUP BY L.EmpNo, L.Name;
- (b) SELECT L.EmpNo, L.Name, SUM(F.Budget) AS TotalFund
FROM Lecturer AS L LEFT OUTER JOIN Research_Fund AS F
ON L.EmpNo = F.EmpNo GROUP BY L.EmpNo, L.Name;
- (c) SELECT L.EmpNo, L.Name, F.TotalFund
FROM Lecturer AS L LEFT OUTER JOIN
(SELECT EmpNo, SUM(Budget) AS TotalFund FROM Research_Fund
GROUP BY EmpNo) AS F ON L.EmpNo = F.EmpNo;
- (d) SELECT L.EmpNo, L.Name, SUM(F.Budget) AS TotalFund
FROM Lecturer AS L, Research_Fund AS F WHERE L.EmpNo = F.EmpNo
GROUP BY L.EmpNo, L.Name;
- (e) SELECT L.EmpNo, L.Name, F.TotalFund
FROM Lecturer AS L RIGHT OUTER JOIN (SELECT EmpNo, SUM(Budget)
AS TotalFund FROM Research_Fund) AS F ON L.EmpNo = F.EmpNo
GROUP BY L.EmpNo;

Consider the following Lecturer relation with the given attributes and data types to answer questions from (23) to (27). Assume that the attributes are stated in the order that they were specified in the create table statement. Salary and Income are monthly income for a lecturer.

**Lecturer(EmpNo CHAR(03), Name VARCHAR(50), Salary REAL,
Allowance REAL, Research_SupNo CHAR(03),
Category VARCHAR(25), DateJoined DATE, DNo CHAR(02))**

- 23) Which of the following SQL statements display the name and annual income for each lecturer?

- (a) SELECT Name, (Salary + Allowance) * 12 FROM Lecturer;
- (b) SELECT Name, (Salary + Allowance) * 12 as Annual Income FROM Lecturer;
- (c) SELECT Name, "Annual Income" FROM Lecturer WHERE "Annual Income" =
Salary * 12 + Allowance;
- (d) SELECT Name , "Annual Income" FROM Lecturer GROUP BY Name HAVING
"Annual Income" = Salary * 12 + Allowance;
- (e) SELECT Name, Salary + Allowance as Annual Income FROM Lecturer;

- 24) Which of the following SQL statements would display all Lecturers' names and hired dates in chronological order with the person on staff with the longest service, listed first?

- (a) SELECT Name, DateJoined FROM Lecturer ORDER BY DateJoined;
- (b) SELECT Name, DateJoined FROM Lecturer ORDER BY Name, DateJoined;
- (c) SELECT Name, DateJoined FROM Lecturer ORDER BY Name, DateJoined ASC
- (d) SELECT Name, DateJoined FROM Lecturer ORDER BY DateJoined DESC;
- (e) SELECT Name, DateJoined FROM Lecturer ORDER BY DateJoined ASC;

- 25) Consider the following details of a Lecturer. Note SYSDATE returns the current system date.

EmpNo – 175, Name – Wimal Dias, Salary - 25,000, Allowance – 10,000,
Research_SupNo – 015, Category – Instructor, DateJoined - SYSDATE , DNo - 05

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

- (a) INSERT INTO Lecturer
VALUES ('175', 'Wimal Dias', 25000, 10000, '015', 'Instructor', SYSDATE, '05');

(b) INSERT INTO Lecturer (EmpNo, Name, Salary , Allowance, Research_SupNo, Category , DateJoined, DNo)
VALUES ('175', 'Wimal Dias', 25000, 10000, '015', 'Instructor', SYSDATE, '05');

(c) INSERT INTO Lecturer (EmpNo, Name, Salary , Allowance, Research_SupNo, Category , DateJoined, DNo)
VALUES ('175', 'Wimal Dias', 25,000, 10,000, 'Instructor' '015', SYSDATE, '05');

(d) INSERT INTO Lecturer
VALUES ('175', 'Wimal Dias', 'Instructor', 25000, 10000, '015', SYSDATE, '05');

(e) INSERT (EmpNo, Name, Salary , Allowance, Research_SupNo, Category , DateJoined, DNo)
VALUES ('('175', 'Wimal Dias', 25000, 10000, '015', 'Instructor', SYSDATE, '05')
INTO Lecturer;

- 26) Consider the following two queries to display the Lecturer's name and also the name of the Lecturer's research supervisor in alphabetical order.

(I) SELECT L.Name as Lec_Name, S.Name as Sup_Name
FROM Lecturer L, Lecturer S
WHERE L.EmpNo = S.Research_SupNo
ORDER BY S.Name;

(II) SELECT L.Name as Lec_Name, S.Name as Sup_Name
FROM Lecturer L, Lecturer S
WHERE L.Research_SupNo = S.EmpNo
ORDER BY S.Name;

Which of the following is/are correct?

- (a) Both queries will display the Lecturer's name and also the name of the Lecturer's supervisor in alphabetical order.

(b) Output of the two queries will be different.

(c) Only query (I) will give the required results.

(d) Only query (II) will give the required results.

(e) Neither query (I) nor query (II) will give the required results.

- 27) Which of the following SQL statements will increase the Salary by Rs: 3000/= for Lecturers who are categorised as *Senior Lecturers*?

- (a) UPDATE Lecturer SET Salary = Salary + 3000 WHERE Category = 'Senior Lecturer';

(b) UPDATE Salary SET Salary = Salary + 3000
FROM Lecturer WHERE Category = 'Senior Lecturer';

(c) UPDATE Lecturer SET Salary = Salary + 3000 WHERE EmpNo
IN (SELECT EmpNo FROM Lecturer WHERE Category = 'Senior lecturer');

(d) UPDATE SET Salary + 3000 FROM Lecturer WHERE Category = 'Senior lecturer';

(e) UPDATE SET Salary = Salary + 3000 FROM Lecturer WHERE Category = 'Senior lecturer';

28) Which of the following statements is/are correct with respect to views?

- (a) Any view defined using a single table is updateable.
- (b) Query materialization is efficient for views defined via complex queries which are time consuming to execute.
- (c) The clause WITH CHECK OPTION is used to materialize views.
- (d) The view mechanism provides support for physical data independence in the relational model.
- (e) The DROP VIEW command will drop a view along with the other views which are defined on the view that is being dropped.

29) Suppose there is a relation declared as follows:

```
CREATE TABLE Employee (Name VARCHAR(50) PRIMARY KEY,  
Salary INT CHECK(Salary <= 40000) );
```

Initially, the relation has three records:

Name	Salary
Perera	10000
Costa	20000
Silva	30000

We execute the following sequence of modifications. Some of them may be rejected due to the constraints in the relation.

- (i) INSERT INTO Employee VALUES ('Dias', 12000);
- (ii) UPDATE Employee SET Salary = 50000 WHERE Name = 'Silva';
- (iii) INSERT INTO Employee VALUES ('Perera', 13000);
- (iv) DELETE FROM Employee WHERE Name = 'Costa';

At the end of these statements, the sum of the Salaries over all the tuples in Employee relation is:

- | | | |
|------------|------------|------------|
| (a) 52,000 | (b) 62,000 | (c) 65,000 |
| (d) 72,000 | (e) 85,000 | |

30) Consider the following table of Employee(Name VARCHAR(10), Salary NUMBER, Commission NUMBER) relation and the four SQL statements given below.

Name	Salary	Commission
Aysha	10000	10
Chamath	10000	
Dulip	15000	5
Fathima	20000	10
Hiran	12000	
Ian	14000	5

Note: NVL function lets you substitute a value when a NULL to value is encountered.

- (i) SELECT AVG(Commission) FROM Employee;
- (ii) SELECT AVG(NVL(Commission,0)) FROM Employee;
- (iii) SELECT SUM(Commission)/COUNT(*) AS Avg_Com FROM Employee;
- (iv) SELECT SUM(Commission)/COUNT(Commission) AS Avg_Com FROM Employee;

Which of the following is/are correct?

- | | |
|---|---|
| (a) (i) and (iii) will give the same results. | (b) All (i) to (iv) will give the same results. |
| (c) (i) and (iv) will give the same results. | (d) (ii) and (iii) will give the same results. |
| (e) (iii) and (iv) will give a syntax error. | |

- 31) Suppose relation R1(A,B) has tuples {(a,b), (a,b), (c,d)}, and relation R2(B,C) has tuples {(b,e), (b,e), (d,f), (g,h)}. Consider the following SQL query.

SELECT * FROM R1 RIGHT OUTER JOIN R2 ON R1.B = R2.B ;

What is the number of tuples in the result of the above SQL query?

(a) 2 (b) 3 (c) 5 (d) 6 (e) 4

- 32) Consider the relation R1(A,B) which has got duplicate tuples as given below.

A	B
12	10,000
12	10,000
12	25,000
14	20,000
14	25,000

Based on the tuples given in R1 which of the following queries has a result that does not produce duplicates?

- (i) SELECT A FROM R1 WHERE A = 12;
- (ii) SELECT MAX(B) FROM R1 GROUP BY A;
- (iii) SELECT A,B FROM R1 GROUP BY A,B;

(a) (i) only (b) (ii) only (c) (iii) only
(d) (i) and (ii) only (e) (ii) and (iii) only.

Consider the relation R1(A,B,C,D,E) with the given Functional Dependencies to answer questions from (33) to (35).

$CE \rightarrow D$, $D \rightarrow B$, $C \rightarrow A$

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

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

- 34) What of the following statements is/are true?

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

- 35) Which of the following statements is/are true with respect to the decomposition of R1 for BCNF?

(a) R1 is in BCNF and no further decomposition is required.
(b) This cannot be decomposed into BCNF preserving functional dependency.
(c) The BCNF decomposition is (A, C) (B,C,D,E,F).
(d) The BCNF decomposition is (A, C), (C,D,E), (B,D)
(e) The BCNF decomposition is (A,C,E), (B,D), (C,D)

- 36) Consider the relation Faculty(Facid, Fname, Office, Phone) with functional dependencies
 $\text{Facid} \rightarrow \text{Fname, Office, Phone}$
 $\text{Office} \rightarrow \text{Phone}$
 What is the best normal form that Faculty satisfies?
- | | | |
|---------|----------|---------|
| (a) 0NF | (b) 1NF | (c) 2NF |
| (d) 3NF | (e) BCNF | |
- 37) Consider the relation Employee(Empid, NIC, Ename, Address, Salary) with the following functional dependencies
 $\text{Empid} \rightarrow \text{NIC, Ename, Address, Salary}$
 $\text{NIC} \rightarrow \text{Empid, Ename, Address, Salary}$
 What is the best normal form that Employee satisfies?
- | | | |
|---------|----------|---------|
| (a) 0NF | (b) 1NF | (c) 2NF |
| (d) 3NF | (e) BCNF | |
- 38) Consider the relation Inventory(PartNo, Warehouse, Location, Qty-on-hand, Weight, Colour) with the following functional dependencies.
 $\text{FD1 : PartNo} \rightarrow \text{Weight, Colour}$
 $\text{FD2 : (PartNo, Warehouse)} \rightarrow \text{Qty_on_hand}$
 $\text{FD3: Warehouse} \rightarrow \text{Location}$
 Which of the following statements is/are true?
- | |
|---|
| (a) The functional dependency FD1 violates 2NF.
(b) The functional dependency FD2 violates 1NF.
(c) The functional dependency FD3 violates 3NF.
(d) The best normal form that Inventory satisfies is 1NF.
(e) The best normal form that Inventory satisfies is 2NF. |
|---|
- 39) If the Inventory(PartNo, Warehouse, Location, Qty-on-hand, Weight, Colour) relation is decomposed as given below:
- Parts(PartNo, Weight, Colour)
 Instock(PartNo, Warehouse, Qty_on_hand)
 Warehouse(Warehouse, Location)
- This decomposition
- | |
|--|
| (a) is in 3NF but not in BCNF.
(b) is in BCNF.
(c) preserves lossless join and not dependency preservation.
(d) preserves dependency preservation and not lossless join.
(e) preserves both lossless join and dependency preservation. |
|--|

Consider the scenario given below to answer questions from (40) to (42)

User1 who works for a bank creates Account_detail relation and Grants Select on all of its attributes and grants Update privilege on the attribute acct_balance to User2 with Grant Option. User2 then creates a view called Savings by selecting all the attributes of the Account_detail using Acct_type = "Savings" as the selection criteria. User2 gives User3 the Select privileges on all the attributes of Savings view with Grant Option. User3 defines a view called Fine_Customers through selecting Savings view for acct_balance over Rs 5,000,000 along with the clause 'With Check Option'.

40) What happens if User1 revokes the Select privilege on Account_detail from User2?

- (a) User2 is unable to Select/Update from Account_detail but he is able to Select/Update from the view Savings.
- (b) User3's privileges will also get revoked, but Fine_Customers View remains intact.
- (c) The View Savings will get dropped.
- (d) User1 is unable to revoke User2's privilege even if CASCADE clause is used since two views have been created based on the privileges of User2.
- (e) The View Fine_Customers will get dropped.

41) Suppose that instead of revoking privileges from User2, User1 decides to give Insert privileges on Account_detail to User2 with Grant Option. Which of the following statements is/are true?

- (a) User2 will automatically get Insert privileges on the View Savings.
- (b) Insert privilege is not applicable on Savings since that privilege was not there at the creation time of the Savings view.
- (c) User2 acquires insert privileges on Savings and as a result, User3 also acquires insert privileges on Fine_Customers.
- (d) User3 will not get insert privilege unless User2 grants that privilege to User3.
- (e) If User3 gets insert privileges, he is able to insert rows into the Account_detail relation.

42) Consider the following SQL statement:

```
GRANT SELECT, UPDATE(acct_balance) ON Account_detail TO X1, X2
WITH GRANT OPTION;
```

What would this SQL statement do?

- (a) Grant permission to X1, only to retrieve data from Account_detail relation and grant permission to X2, only to update the acct_balance from Account_detail relation.
- (b) Grant permission to X1 and X2 to retrieve data from Account_detail table.
- (c) Grant permission to X1 in order to grant, select and update permission to X2.
- (d) Grant permission to X1 and X2 to update acct_balance of customers in the Account_detail relation.
- (e) Grant permission to X1 and X2 to update all data except acct_balance in Account_detail relation.

43) Which of the following statements is/are correct?

- (a) In a client-server system, server is responsible for managing data and transaction execution.
- (b) In a distributed database system, data replication will be slower than the query evaluation.
- (c) The middleware layer maintains data relevant to the frequently used queries.
- (d) The middleware layer coordinates the execution of queries across database servers.
- (e) Data fragmentation in distributed databases will always increase message-passing cost.

44) Consider the following statements with respect to accessing a database from an application program.

- (i) Dynamic SQL Commands involve runtime overhead and hence should limit the use of dynamic SQL.
- (ii) Embedded SQL enables to execute dynamic queries at run time.
- (iii) Cursors are declared to retrieve rows one at a time from a relation.

Which of the above statements is/are correct?

- | | | |
|---------------|-------------------------|--------------------------|
| (a) (i) only. | (b) (i) and (iii) only. | (c) (ii) and (iii) only. |
| (d) All. | (e) (iii) only. | |

45) Which of the following is/are correct regarding data mining?

- | |
|---|
| (a) Data mining helps in extracting meaningful new patterns from a vast amount of data. |
| (b) Data mining cannot be applied to operational databases. |
| (c) Data mining only allows us to view information along a single dimension. |
| (d) Data mining allows analyzing data by categorization and summarization of data. |
| (e) A successful use of data mining applications will depend first on the construction of a data warehouse. |
