



UNIVERSITY OF COLOMBO, SRI LANKA

UNIVERSITY OF COLOMBO SCHOOL OF COMPUTING

DEGREE OF BACHELOR OF INFORMATION TECHNOLOGY (EXTERNAL)

Academic Year 2003/2004 – 1st Year Examination – Semester 2

IT2302 – Database Management Systems

***15th August, 2004
(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 **12 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 -1 (*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.**

Assume that the SQL questions are based on SQL-2 standards, unless stated otherwise.

- 1) Practitioners and Users are involved with database systems. Which of the statements below is/are **true** regarding them?

- | | |
|--|---------------------------------------|
| (a) Systems Designer is a user. | (b) Departmental Heads are users. |
| (c) Information Systems Manager is a user. | (d) Clerical staff are practitioners. |
| (e) Database Administrators are practitioners. | |

- 2) A database system contains

- | | | |
|-------------------|-------------------------|-------------|
| (a) a database. | (b) security personnel. | (c) a DBMS. |
| (d) a C compiler. | (e) practitioners. | |

- 3) Which of the following statements is a/are characteristic(s) of 'Physical data Independence'?

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|--|
| (a) It hides the database file structure and Indexes. |
| (b) It allows use of 'Views'. |
| (c) It allows changes to the physical storage structure, without affecting the applications. |
| (d) It is not referred to in the ANSI/SPARC 3 tier architecture. |
| (e) It insulates the conceptual schema from changes in the physical storage. |

- 4) Components of a DBMS includes

- | | |
|--|-----------------------------------|
| (a) a user query and reporting facility. | (b) application programs. |
| (c) meta data. | (d) a database access sub system. |
| (e) a security and integrity sub system. | |

- 5) What is/are correct in relation to the ANSI/SPARC 3 level architecture?

- | |
|--|
| (a) It makes databases more independent of applications. |
| (b) The physical design is the responsibility of the DB Administrator. |
| (c) The logical view is a single description of the data elements and their relationships. |
| (d) The database is kept at the 'external level'. |
| (e) Does not allow hiding confidential data from users. |

- 6) The blanks of the following three statements have to be filled.

The (i) level provides the physical view of the database.

The (ii) level gives a user oriented description of the data elements and relationships.

The (iii) level provides all users information needs and definition of data items needs to meet them.

Which of the following will correctly fill the blanks?

- | | |
|---|---|
| (a) (i) conceptual (ii) external (iii) internal | (b) (i) internal (ii) external (iii) conceptual |
| (c) (i) external (ii) conceptual (iii) internal | (d) (i) internal (ii) conceptual (iii) external |
| (e) (i) conceptual (ii) internal (iii) external | |

- 7) Protecting a database from unauthorized or malicious use is termed

- | | | |
|---------------------|-----------------------------|--------------------|
| (a) data integrity. | (b) concurrent processing. | (c) data security. |
| (d) data recovery. | (e) performance evaluation. | |

- 8) Which of the following closely resemble(s) an 'Enterprise Level' database?
- (a) A large health care Organization that operates a group of hospitals.
 - (b) A software development team maintaining a list of software components.
 - (c) A Data warehouse.
 - (d) A student's CD collection database.
 - (e) A salesman's list of contacts.
- 9) Which of the following statements is/are correct, regarding a relation of the relational model?
- (a) Each relation in a database schema has a unique a name.
 - (b) There can be multi-valued attributes in a relation.
 - (c) Each row is identified uniquely.
 - (d) The sequence of columns is significant.
 - (e) Each entry at the intersection of a row and a column is unique.
- 10) Select the correct statement(s) from among the following regarding foreign keys.
- (a) A foreign key is a set of attributes in one relation that corresponds to a primary key in another relation.
 - (b) A foreign key is a set of attributes in one relation that corresponds to a primary key in the same relation.
 - (c) A foreign key is a candidate key designated for principal use in uniquely identifying rows in a relation.
 - (d) Foreign keys are needed to tie data in one relation with data in another relation.
 - (e) A foreign key attribute needs to have the same name as the primary key attribute to which it corresponds.
- 11) Consider the following relations:
- Employee(EmpNo, Name, Dept, Age)
- Department(DeptNo, Name, ManagerID)
- Which of the following statements about the above relation is/are true?
- (a) 'EmpNo' is a primary key.
 - (b) 'EmpNo' and 'Name' can form a super key.
 - (c) 'Dept' can be a foreign key.
 - (d) 'Age' is a composite key.
 - (e) 'DeptNo' is a foreign key.
- 12) Which of the following statements is/are correct in relation to weak entities?
- (a) They do not have key attributes of their own.
 - (b) The attributes are always multi-valued.
 - (c) They have an owner entity.
 - (d) The relationship is always of 1:N type.
 - (e) A weak entity type always has a 'total participation' constraint with its identifying relationship.
- 13) Which of the following statements is/are correct in relation to derived attributes?
- (a) They can be used as a primary key.
 - (b) They can sometimes be found when 'Views' are generated on a stored table.
 - (c) They are not physically stored in the database.
 - (d) They are not found in the EER diagrams.
 - (e) They are always found in 'Weak' entity types.

Questions 14-16 are based on the following information.

The system development life cycle consists of 8 stages, namely,

- | | |
|--|--------------------------|
| (i) Project Identification and Selection | (v) Logical design |
| (ii) Project Initiation and planning | (vi) Physical design |
| (iii) Analysis | (vii) Implementation and |
| (iv) Conceptual design | (viii) Maintenance |

- 14) Which of the following is/are correct regarding the stages of a system development life cycle?

- (a) The maintenance stage is the most expensive stage.
- (b) During the 'Conceptual design' stage, database designers interview prospective database users to document their data requirements.
- (c) In parallel with the 'data requirements' gathering, 'Functional requirement' gathering also takes place.
- (d) Application programs are implemented in the Logical design stage.
- (e) The output of the logical design stage is an ER diagram.

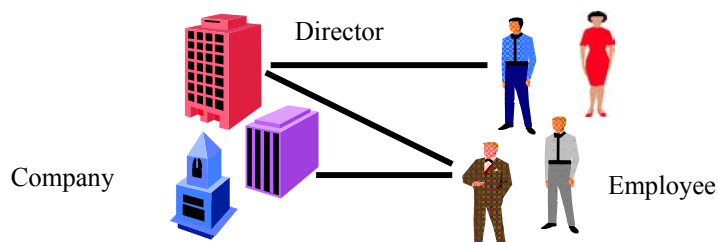
- 15) When the analysis stage is being done, which of the following tasks should be done in relation to the 'database'?

- (a) A relational database should be created.
- (b) Personnel should be interviewed for their data requirements.
- (c) An ER diagram should be drawn.
- (d) An EER diagram should be drawn.
- (e) Indexes should be designed.

- 16) When the Physical design stage is being done, which of the following tasks should be done in relation to the 'database'?

- (a) A relational database should be created.
- (b) Personnel should be interviewed for their data requirements.
- (c) An ER diagram should be drawn.
- (d) An EER diagram should be drawn.
- (e) Indexes should be designed.

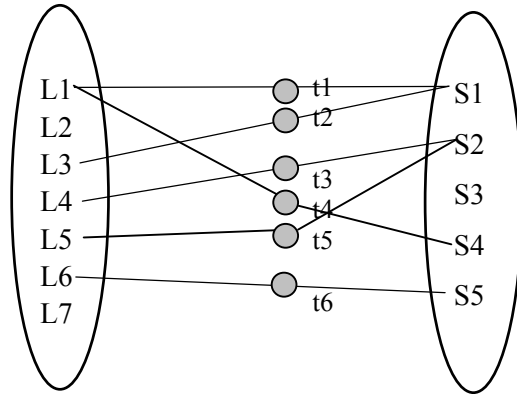
- 17) The following diagram shows instances of companies and their employees. In respect of each company, each instance relationship shown is for the Director who is also an employee of the company.



Which of the following statements is/are true?

- (a) Every employee is a director.
- (b) An employee may be a director of more than one company.
- (c) Every company has a director.
- (d) A company may have more than one director.
- (e) A company can have only one director.

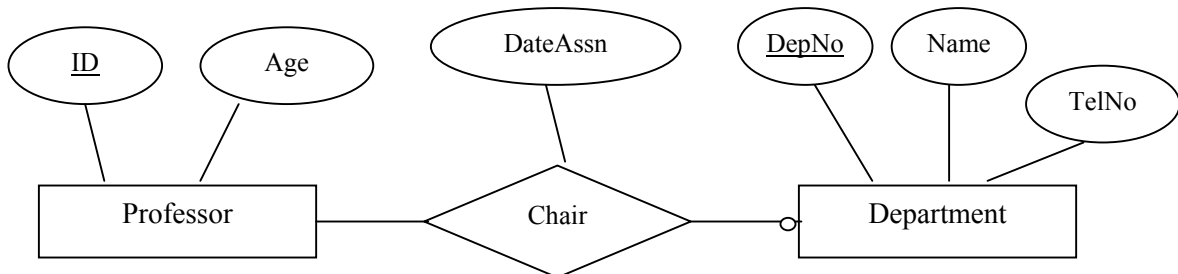
- 18) Following is a mapping of instances of LECTURER and SUBJECT entities related by the relationship named “teach”.



Which of the following business rules is/are true for the mapping of the above relation?

- (a) Every Lecturer teaches a subject.
- (b) A lecturer may teach more than one subject.
- (c) Every Subject has a Lecturer.
- (d) A Lecturer may or may not teach a subject.
- (e) A subject may be taught by more than one lecturer.

- 19) Consider the following ER diagram, which depicts the relationship between a Professor and the departments he may chair.



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) Professor (ID, Age)
- (b) Department (DepNo, Name, TelNo)
- (c) Chair (ID, DateAssn, DepNo)
- (d) Professor (ID, DepNo, Age, DateAssn)
- (e) Department (DepNo, Name, TelNo, Chair, DateAssn)

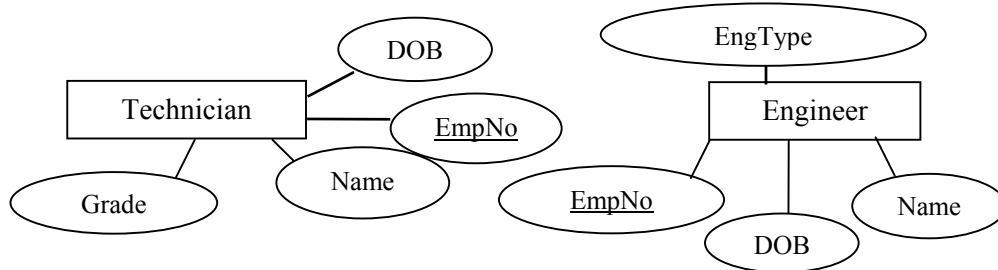
- 20) Which of the following statements is/are correct in relation to a composite attribute?

- (a) These attributes can be divided into smaller sub parts.
- (b) A primary key is always a composite key.
- (c) Composite attributes can sometimes form hierarchies.
- (d) Composite attribute is another name for a derived attribute.
- (e) It is introduced only in EER diagrams.

21) What are correct in terms of the BLOB data type?

- (a) Can refer to a digital image.
- (b) BLOB = Binary Large Object.
- (c) The DBMS does not know the structure of the data.
- (d) Is not part of the data type provided by traditional DBMS.
- (e) May require large amounts of storage space.

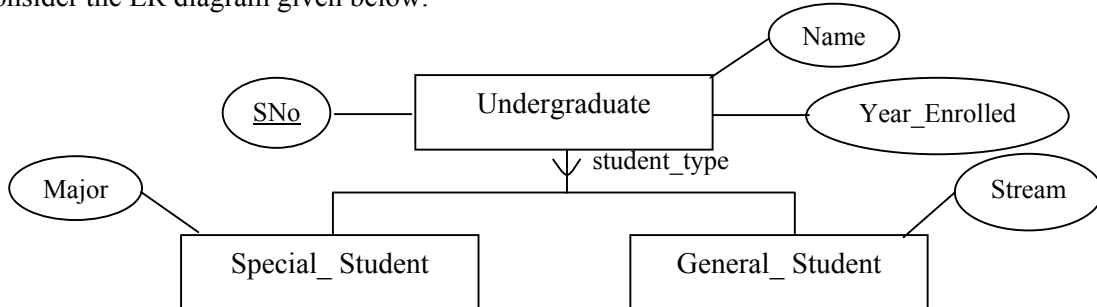
22) Consider the following two entity types identified at the analysis stage of an information system.



If one generalises these two entities by introducing an Employee entity, then, which combination of the following best describes the characteristics of the entities?

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

23) Consider the ER diagram given below.



Consider the following relations.

- (i) Undergraduate(Sno, Name, Year_Enrolled)
- (ii) Undergraduate (Sno, Name, Year_Enrolled, Major, Stream, Student_type)
- (iii) Special_Student(Sno, Major)
- (iv) Special_Student(Sno, Name, Year_Enrolled, Major)
- (v) General_Student (Sno, Stream)
- (vi) General_Student (Sno, Name, Year_Enrolled, Stream)

Which of the following is a/are possible relation(s) if the above ER diagram is mapped into a relational model?

- (a) (i), (iii), (v)
- (b) (i), (iv), (vi)
- (c) (ii)
- (d) (ii), (iii), (v)
- (e) (iv), (vi)

- 24) Consider the following relations and the functional dependencies given thereafter.
 Project (Proj_Num, Proj_Name)
 Employee (Emp_Num, Emp_Name, Job_class, Chg_hours)
 Assign (Proj_Num, Emp_Num, Hours)

FD1: Proj_Num, Emp_Num \longrightarrow Hours
 FD2: Emp_Num \longrightarrow Emp_Name, Job_class, Chg_Hours
 FD3: Proj_Num \longrightarrow Proj_Name
 FD4: Job_class \longrightarrow Chg_Hours

Which of the following is/are correct in relation to the stated normal forms?

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|------------------------|-------------------------|------------------------|
| (a) Project is in 1NF. | (b) Employee is in 2NF. | (c) Project is in 2NF. |
| (d) Assign is in 3NF. | (e) Employee is in 3NF. | |

- 25) Which of the following statements is/are correct regarding normalization?

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|--|
| (a) It reduces update anomalies.
(b) It increases insertion anomalies.
(c) It minimizes redundancy.
(d) There in no zero normal form relations.
(e) Sometimes due to access considerations, a relation may have to be un-normalised. |
|--|

- 26) What are the reasons for a record structure to be de-normalised?

- | |
|---|
| (a) When too many tables are generated due to normalization
(b) For efficiency purposes
(c) When too many joins are necessary to access frequently used data
(d) When Relational Algebra is inefficient in locating data
(e) When we cannot find data using SQL |
|---|

- 27) What are the anomalies which can be present due to un-normalised relations?

- | | | |
|---------------|---------------|--------------|
| (a) insertion | (b) selection | (c) deletion |
| (d) update | (e) none | |

- 28) A certain operation applied to A and B will result in relation C as shown below?

A	
Sal_ID	Prod_ID
110	1035
123	2518
239	2241
239	2518
337	2249
110	2249
239	2249
239	1035

B	
Prod_ID	Name
1035	Sugar
2241	Tea
2249	Milk
2518	Milo

C		
Sal_ID	Prod_ID	Name
110	1035	Sugar
123	2518	Milo
239	2241	Tea
239	2518	Milo
337	2249	Milk
110	2249	Milk
239	2249	Milk
239	1035	Sugar

Which of the following is/are the operation(s)?

- | | | |
|------------------|--------------------------|---------------|
| (a) projection | (b) cartesian product | (c) selection |
| (d) natural join | (e) union operation only | |

29) Consider the following relation and its sample data.

Proj_No	Proj_Name	Emp_No	Emp_Name	Job_Class	Hourly_charge	Hours
15	Evergreen	1030	Silva	Elect. Eng	840.50	230.8
		1010	Perera	Database Designer	1050.00	190.4
		1050	Nonis	Database Designer	1050.00	350.7
		1060	Stephan	Programmer	350.75	120.6
		1020	De-Silva	System Analyst	960.65	230.8
18	Starflight	1140	Kapila	Designer	480.10	240.6
		1180	James	General Support	180.36	450.3
		1040	Asoka	System Analyst	960.75	320.4
		1120	Kosala	DSS Analyst	450.95	440.0
		1050	Nonis	Database Designer	1050.00	640.7

Which of the following is/are true for the above relation?

- (a) The above relation is in first normal form.
- (b) The above relation is un-normalised.
- (c) The insertion of a new Project does not require an insertion of a related Employee name.
- (d) Emp_No field is a multi valued attribute.
- (e) Hours is a derived attribute.

30) Consider the following statements about relational algebra.

- (i) Relational algebra is usually divided into two groups; one group includes set operations from mathematical set theory, and the other group consists of operations developed specifically for relational databases.
- (ii) The PROJECT operation is used to select a subset of tuples from a relation that satisfies a selection condition discarding some of the rows.
- (iii) Relational algebra is non-procedural.
- (iv) The DIVISION operation selects certain rows from a table and discards the other rows.
- (v) UNION and INTERSECTION are two relational algebra operations which require the participating relations to be 'union compatible'.

Which of the above statements is/are correct?

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|----------|----------|-----------|
| (a) (i) | (b) (ii) | (c) (iii) |
| (d) (iv) | (e) (v) | |

31) Consider the following relations:

Student (sno, name, age, address)
 Subject (sub_no, name, lecturer)
 Results (sno, sub_no, marks, grade)

Which of the following instructions can be used to retrieve the names of all the students who scored over 25 marks for any subject?

- | | |
|---|---|
| (a) $A \leftarrow \pi_{\text{sub_no}}(\text{Subject})$ | (b) $A \leftarrow \sigma_{\text{(marks>25)}}(\text{Results})$ |
| (c) $B \leftarrow \text{JOIN Student and A (over sno)}$ | (d) $\pi_{\text{name}}(B)$ |
| (e) JOIN A and Results (over sub_no) | |

32) Which of the following SQL key words is/are used with DML statements?

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|------------|------------|------------|
| (a) CREATE | (b) REVOKE | (c) SELECT |
| (d) UPDATE | (e) GRANT | |

33) The two tables 'Guest' and 'Celebrations' are created using the SQL statements given below.

CREATE TABLE Guest (guestname CHARACTER(30) PRIMARY KEY,
arrival DATE NOT NULL, departure DATE NOT NULL);

CREATE TABLE Celebrations (celebname CHARACTER(30) PRIMARY KEY,
start_date DATE NOT NULL, finish_date DATE NOT NULL);

Which of the following is/are correct with respect to the expected outcome after executing 'SELECT guestname, 'arrival duration', celebname FROM Guest, Celebrations WHERE arrival BETWEEN start_date AND finish_date;'?

- | |
|---|
| (a) Will give a syntax error and not execute the query |
| (b) Will give a 2 column list as output |
| (c) Will give a 3 column list as output, with the middle column being 'NULL' |
| (d) Will give a 3 column output |
| (e) Will have the column headings as – 'guestname', 'arrival duration', 'celebname' |

34) What SQL key words are used with DDL statements?

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|------------|------------|-----------|
| (a) CREATE | (b) SELECT | (c) GRANT |
| (d) REVOKE | (e) ALTER | |

35) Consider the following five tasks.

- (i) Changing data in one or more rows in a table.
- (ii) Defining a View
- (iii) Removing a row from a table
- (iv) Changing data in a particular column
- (v) Removing a view

Which SQL keywords have to be used to accomplish the above five tasks?

- | | | | | |
|----------------|-------------|--------------|-------------|------------|
| (a) (i) ALTER | (ii) CREATE | (iii) DELETE | (iv) UPDATE | (v) DROP |
| (b) (i) ALTER | (ii) CREATE | (iii) INSERT | (iv) UPDATE | (v) DELETE |
| (c) (i) UPDATE | (ii) CREATE | (iii) DELETE | (iv) UPDATE | (v) DROP |
| (d) (i) UPDATE | (ii) CREATE | (iii) DROP | (iv) INSERT | (v) UPDATE |
| (e) (i) UPDATE | (ii) CREATE | (iii) UPDATE | (iv) INSERT | (v) DROP |

36) Which of the following statements have correct syntax?

- | |
|--|
| (a) SELECT * FROM project WHERE dnum =5; |
| (b) SELECT UNION pnum FROM project WHERE dnum = 5 |
| (c) SELECT name FROM employee WHERE sal > ALL
(SELECT sal FROM employee WHERE dno=5); |
| (d) SELECT name FROM employee WHERE name LIKE &Mal&; |
| (e) SELECT Dname, Lname, Fname FROM employee WHERE dno = 3
GROUP BY Lname |

Questions 37 and 38 are based on the following description.

The following three relations show a subset of data stored in a database created to store information about various projects undertaken by a software development company.

EMPLOYEE

EMP_ID	NIC_NO	NAME	PAY_PER_DAY
001	633567877V	A. S. S. Wijesena	600.00
002	605634652V	C. H. De Silva	600.00
003	653476128V	H. H. Jayasekara	500.00
004	692068563V	K. S. Sunil	500.00
005	708034567V	V. Wijethilake	450.00

PROJECT

PROJECT_ID	PROJECT_NAME	MANAGER_ID
R001	MIS for ABC Company	001
H001	Ticketing System for XYZ Theatre Ltd	002
P001	Information system for UCSC Library	002

ALLOCATION

EMP_ID	PROJECT_ID	DATE_STARTED	NUM_OF_DAYS
001	R001	12/02/04	4
001	H001	18/02/04	3
001	P001	22/02/04	2
002	P001	15/02/04	3
002	H001	19/02/04	5
002	R001	23/02/04	2

- 37) Which of the following SQL statements could be used to retrieve a list of employee identities (EMP_ID) and their names (NAME) without duplicates for those who are also managers of one or more projects?

- (a) **SELECT DISTINCT EMP_ID, NAME
FROM EMPLOYEE, PROJECT
WHERE EMP_ID = MANAGER_ID**

(b) **SELECT DISTINCT EMP_ID, NAME
FROM EMPLOYEE
WHERE EMP_ID IN (SELECT MANAGER_ID FROM PROJECT)**

(c) **SELECT EMP_ID, NAME
FROM EMPLOYEE
WHERE EMP_ID IN (SELECT DISTINCT MANAGER_ID
FROM PROJECT)**

(d) **SELECT EMP_ID, NAME
FROM EMPLOYEE
WHERE EXISTS (SELECT MANAGER_ID
FROM PROJECT WHERE MANAGER_ID = EMP_ID)**

(e) **SELECT UNIQUE EMP_ID, NAME
FROM EMPLOYEE, PROJECT
WHERE EMP_ID = MANAGER_ID**

- 38) The following incomplete SQL statement, once completed, is expected to be used to retrieve all employees who have not worked on at least one project?

```
SELECT EMP_ID FROM EMPLOYEE
WHERE ..... (SELECT * FROM ALLOCATION
              WHERE EMPLOYEE.EMP_ID=ALLOCATION.EMP_ID);
```

Fill in the blank with the correct keyword.

- | | | |
|------------|----------------|---------|
| (a) EXISTS | (b) NOT EXISTS | (c) ALL |
| (d) EXIST | (e) NOT IN | |

- 39) The following 'Project' table is part of a relational database.

Project (Pname, Pnumber, Plocation, Dnum, Bud)

Pname – name of project, Pnumber – project number, Plocation – location of project

Dnum – number of the controlling department of project, Bud – the budget allocated to the project

Which of the following SQL statements perform(s) the indicated task?

- | |
|--|
| (a) <u>Task</u> : Define a view to retrieve the projects which are controlled by department 4.
<u>SQL</u> : CREATE TABLE dept_four(name, num, loc, budget) AS
(SELECT Pname, Pnumber, Plocation, Bud FROM Project WHERE Dnum = 4); |
| (b) <u>Task</u> : Increase the budget of all projects by 10%.
<u>SQL</u> : UPDATE Project SET Bud = Bud * 1.1; |
| (c) <u>Task</u> : Insert the new Project "Mahaweli" with project number 33 located in Galle with a budget of 34,000 and controlled by department 4.
<u>SQL</u> : INSERT INTO Project VALUES('Mahaweli', 33, 'Galle', 4, 34000); |
| (d) <u>Task</u> : Delete the Project "Mahaweli".
<u>SQL</u> : DELETE Project WHERE name = 'Mahaweli'; |
| (e) <u>Task</u> : Retrieve the average budget for each controlling department.
<u>SQL</u> : SELECT AVG(Bud), Dnum FROM Project GROUP BY Dnum; |

- 40) Consider the following two relations:

Employee (Fname, Lname, ssn, sex, address, dno)

Dependant (essn, First_name, sex, relation_ship)

Also consider the SQL statement given below:

```
SELECT E.Fname, E.Lname FROM Employee AS E WHERE EXISTS
(SELECT * FROM Dependant WHERE E.ssn=essn AND E.sex=sex AND E.Fname=First_name);
```

Select the correct statement(s) from among the following with respect to the above SQL statement.

- | |
|---|
| (a) The query has an error and hence will not execute. |
| (b) It gives a list of employee names who have a dependant with the same first name and sex. |
| (c) It can be considered as a nested query. |
| (d) The query output will contain all the information drawn from the employee and dependant tables. |
| (e) The output list contains all the information of the employees and is sorted by employee_no. |

- 41) Consider the following SQL statement.
GRANT SELECT, INSERT, DELETE, UPDATE ON Teach TO Noel;
- Which of the following statements is/are correct?
- (a) Noel is given the rights to retrieve data in the 'Teach' relation.
 - (b) Noel is given the rights to update data in the 'Teach' relation.
 - (c) Noel cannot delete any records in the 'Teach' relation.
 - (d) Noel is granted permission to grant select, insert, delete and update privileges to other users.
 - (e) This command will not work as it is syntactically incorrect.
- 42) What are the correct features of a distributed database?
- (a) Is always connected to the internet
 - (b) Always requires more than three machines
 - (c) Users see the data in one global schema.
 - (d) Have to specify the physical location of the data when an update is done
 - (e) All DBMS have to be homogenous.
- 43) What statements are correct in relation to Triggers?
- (a) It is a technique for specifying active rules.
 - (b) Triggers have 'events' that trigger the rule.
 - (c) An 'event' for a trigger can only be an 'insert' operation.
 - (d) For a trigger, there is an 'action' that should be taken.
 - (e) The 'action' for a trigger has to always be an update operation.
- 44) Which of the following statements is/are correct in relation to data Mining?
- (a) It refers to the discovery of new information from present data.
 - (b) It is similar to an SQL query.
 - (c) It requires a large amount of data.
 - (d) It can be done even with small amounts of data.
 - (e) It uses pattern matching techniques.
- 45) Which of the following statements is/are correct in relation to data warehousing?
- (a) It uses a collection of 'Decision support techniques'.
 - (b) Before data is added to the 'warehouse', it is cleaned and reformatted.
 - (c) Using a 'data warehouse', data mining can be done.
 - (d) A data warehouse is a miniature version of a data mart.
 - (e) Data does not need to be cleaned or reformatted to be added to a 'data warehouse'.
