

Information and Technology – Competency 8

(Past papers 2011 - 2022)

No - 07

2011 A/L

1. Which of the following database types is widely used in computer applications?
 - 1) Flat file
 - 2) Hierarchical
 - 3) Network
 - 4) Relational
 - 5) Object oriented
2. Consider the following statements about computerized databases:
 - A. Need more human resources to manage the computerized database than a manual system.
 - B. Retrieval of data is efficient than a manual system.
 - C. No data duplications.
 - D. Need more space to store data than a manual system.

Which of the above statements are correct with respect to a properly designed database?

- 1) A and B only.
- 2) A and D only.
- 3) B and C only.
- 4) B and D only.
- 5) C and D only.

Consider the following system description and the relations A, B, C and D given below to answer the following questions 3,4 and 5.

A principal of a National school wants to develop a database to maintain Admission Number, Student Name, Address, National Identity Card Number (NIC) and the Date of Birth (DOB) of Advanced Level students. The principal also wants to know the marks obtained for each subject by the students. In addition to the above requirements, the principal needs to know the subjects assigned to the teachers.

Relations:

- A. Student (admissionNo, tudentName, address, DOB, NIC)
- B. Subject (subjectCode, subjectName)
- C. Mark (admissionNo, subjectCode, marksObtained)
- D. Teacher (teacherNo, subjectCode, teacherName, subjectName, class)

3. Which of the above relations are in the third normal form?

- 1) A and C only
- 2) A and D only
- 3) A, B and C only
- 4) A, C and D only
- 5) B, C and D only

4. Which of the following combinations of attributes provides the minimal set of primary keys for the relations Student, Subject and Mark respectively?

- 1) admissionNo and NIC, subjectCode, admissionNo
- 2) NIC, subjectCode, subjectCode
- 3) admissionNo, subjectCode, subjectCode
- 4) admissionNo, subjectCode, admissionNo and subjectCode
- 5) admissionNo, subjectName, admissionNo and subjectCode

5. Which of the following SQL statements would produce an output with admission number, name of the student, subject code and marks obtained?

- 1)

```
SELECT studentName, subjectCode, marksObtained
FROM Student, Mark
WHERE Student.admissionNo = Mark.admissionNo
```
- 2)

```
SELECT
Student.admissionNo,studentName,subjectCode,Student.marksObtained
FROM Student, Mark
WHERE Student.admissionNo = Mark.admissionNo
```
- 3)

```
SELECT
Student.admissionNo,studentName,subjectCode, marksObtained
FROM Student, Mark
WHERE Student.admissionNo = Mark.admissionNo
```

4) SELECT
Student.admissionNo,studentName,subjectCode, marksObtained
FROM Student, Mark
WHERE Student.admissionNo = admissionNo

5) SELECT
Student.admissionNo,studentName,subjectCode, marksObtained
FROM Student, Mark
WHERE admissionNo = Mark.admissionNo

6. Consider the following statements with respect to ER diagram:
- A. An ER diagram has entities and relationships.
 - B. Cardinality of all relationships should always be one-to-one.
 - C. Entities may have attributes.
 - D. There could be binary and tertiary relationships.

Which of the above statements are correct?

- 1) A and D only
- 2) B and C only
- 3) B and D only
- 4) A, C and D only
- 5) B, C and D only

2012 A/L

7. Which of the following statements is correct about relational databases?
- 1) The primary key of a table is selected from alternate keys.
 - 2) Duplicate values are not allowed in a foreign key field of a table.
 - 3) A table can not be created without a primary key.
 - 4) A foreign key of a table should be the primary key of another table.
 - 5) A table should have alternate keys.

8. Consider the following models:

- A. Network
- B. Waterfall
- C. Relational

Which of the above is a /are database model/s?

- 1) A only
- 2) B only
- 3) C only
- 4) A and B only
- 5) A and C only

9. Consider the following statements about **Relational Database**:

- A. A table is considered as an object.
- B. A column of data in a table is called a field/an attribute of that table.
- C. A row of data in a table is called a record.

Which of the above statements is/are correct?

- 1) A only.
- 2) B only.
- 3) A and B only.
- 4) A and C only.
- 5) B and C only.

10. Consider the following statements with respect to ER diagrams:

- A. A relationship in an ER diagram can be implemented as a table in a relational database.
- B. A relationship may have attributes attached to it.
- C. Only two entities can be attached to a relationship.

Which of the above statements is/are correct?

- A. A only.
- B. B only.
- C. A and B only.
- D. A and C only.
- E. B and C only.

11. Consider the following relation:

student (stdNo, name, address, nicNo, date_of_birth)

which of the following SQL (Structured Query Language) statements on the student relation is syntactically correct?

- 1) select ** from student
- 2) select all from student
- 3) select * from student
- 4) select stdNo.name from student
- 5) select stdNo; name from student

12. Consider the following database operations:

- A. Remove records from a table
- B. Add new data to a table
- C. Modify the existing data in a table
- D. Retrieve data from a table

“The SQL statements should be used to perform the database operations A, B, C and D respectively”

Which of the following is most appropriate to fill the blank in the above statement?

- 1) Delete, select, update and insert
- 2) Delete, insert, select and update
- 3) Select, delete, insert and update
- 4) Insert, select, delete and update
- 5) Delete, insert, update and select

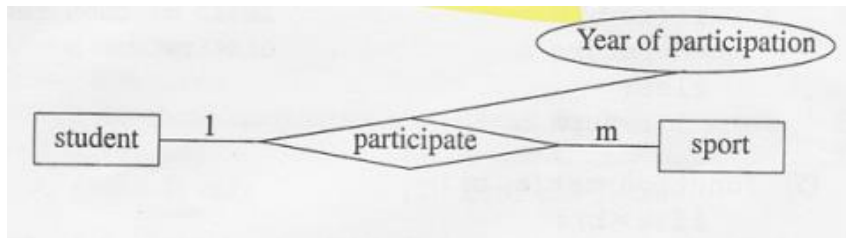
13. Which of the following statements about relational databases is correct?

- 1) A value of a composite key of a table can be null.
- 2) Null values are allowed in any column of a table.
- 3) Two or more columns of a table can be combined to create the primary key.
- 4) Values of a foreign key of a table cannot be updated.
- 5) Once created, the structure of a table cannot be altered.

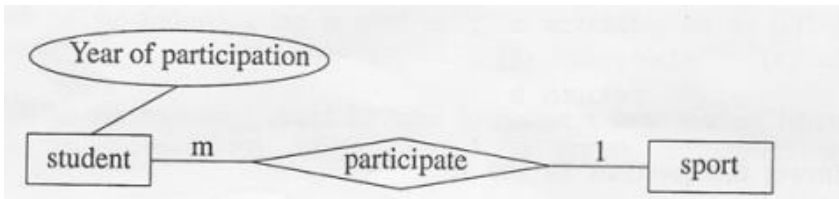
2013 A/L

14. Which of the following is the most appropriate Entity Relationship (ER) diagram to represent students' participation in different sports in school?

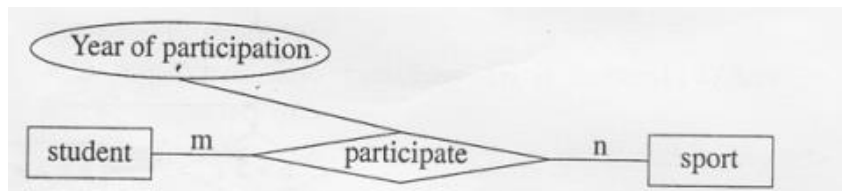
1)



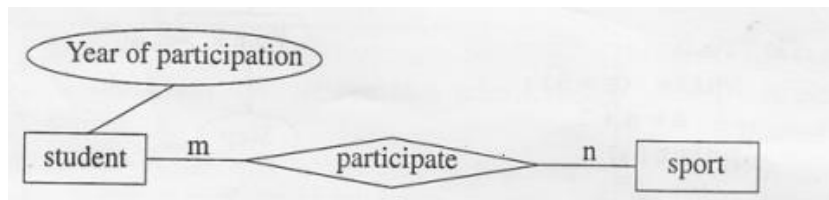
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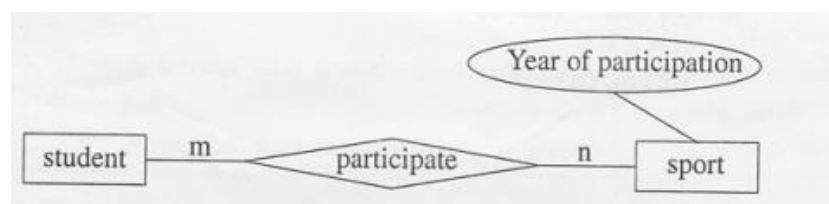
3)



4)



5)



15. Which of the following is correct with respect to a relational database?
- 1) Any subset of Alternate Keys is called Candidate Key.
 - 2) A Primary Key is selected from Alternate Keys.
 - 3) A Foreign Key is an Alternate key.
 - 4) Always Primary Key and Foreign Key are combined to create a Compound Key.
 - 5) Primary Key and Foreign Key establish the relationship between two tables.

16. Consider the following statements regarding relational databases:

- A. Changing the column order of relations in a database structure does not necessarily require changes in application programs.
- B. Main objective of normalization of databases is to reduce data redundancy.
- C. Adding new data to the database always requires changes to the existing programs.

Which of the above statements is/are correct?

- 1) A only
- 2) B only
- 3) A and B only
- 4) A and C only
- 5) All A, B and C

17. Consider the following two relations:

student(stdNo, name)

courseMarks(coursed, stdNo, marks)

Which of the following SQL (Structured Query Language) statements on the above relations is syntactically correct?

- 1) Select stdNo, ,arks from student, courseMarks
- 2) Select * from student and courseMarks
- 3) Select s.stdNo and c.marks from student s , courseMarks c
- 4) Select student.stdNo, courseMarks.marks from student, courseMarks where student.stdNo = courseMarks.stdNo
- 5) Select student.stdNo and courseMarks.marks from student and courseMarks where student.stdNo=courseMarks.stdNo

2014 A/L

18. Which of the following relations is in the 3rd normal form?

- 1) Student(studentIndexNo, name, parentName)
- 2) Sport(sportId, sportName, teacherName, teacherId)
- 3) Teacher(teacherId, teacherName, telephoneNumber, subjectName, subjectId)
- 4) Book(ISBN, title)
- 5) Patient(patientId, patientName, ward, wardId)

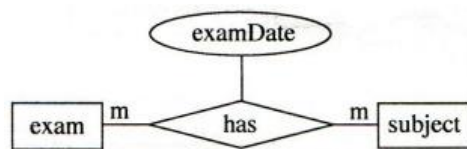
Consider the following three tables in a relational database to answer the following two questions. Assume that a subject has only one paper for an examination.

subject		exam		examSubject		
subjectId	title	examId	name	examId	subjectId	examDate
SUB001	Information and Technology	EXAM001	GCE OL	EXAM001	SUB001	2014.12.12
SUB002	Chemistry	EXAM002	GCE AL	EXAM002	SUB001	2014.8.21
SUB003	Physics			EXAM002	SUB002	2014.8.21
				EXAM002	SUB003	2014.8.21

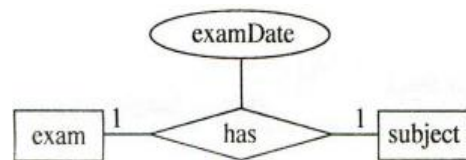
19. Which of the following is the most suitable Entity Relationship (ER) diagram to represent the above relational database tables?

- 1)
- 2)
- 3)

4)



5)



20. Which of the following is the correct primary key for examSubject table?

- 1) examId
- 2) examId, subjectId
- 3) examId, examDate
- 4) subjectId, examDate
- 5) examId, subjectId, name

21. Which of the following is the correct SQL statement to retrieve examId, name, and examDate of all examinations?

- 1) Select examSubject.examId, name, examDate from exam, examSubject where exam.examId=examSubject.examId
- 2) Select examId, name, examDate from exam, examSubject where exam.examId=examSubject.examId
- 3) Select examId and name and examDate from exam and examSubject where exam.examId=examSubject.examId
- 4) Select * from exam and examSubject where exam.examId=examSubject.examId
- 5) Select * from exam, examSubject where exam.examId=examSubject.examId

22. Which of the following SQL statements changes only the date of examination of Physics paper of GCE AL examination to 2014.08.25?

- 1) Update examSubject set examDate='2014.08.25' where subjectId='SUB003' or 'sub003'
- 2) Update examSubject set examDate='2014.08.25' where examId='EXAM002' or subjectId='SUB003'
- 3) Update examSubject set examDate='2014.08.25' where examId='EXAM002' and subjectId='SUB003'
- 4) Update examSubject set examDate='2014.08.25' where examDate='2014.08.21'
- 5) Update examSubject set examDate='2014.08.25' where examId='EXAM002' or subjectId='SUB003' or examDate='2014.08.23'

2015 A/L

Consider the following relations to answer following three questions.

Programmer (programmerId, programmerName, gender, NIC, mobilePhoneNumber, degree, universityName)

Client (clientId, clientName, address, telephoneNumber)

Project (projectId, projectName, clientId, startDate, endDate, cost)

workFor (programmerId, projectId, startDate, endDate)

23. Consider the following statements:

- A. A programmer works for at most one project at any given time.
- B. A programmer is assigned to a single client at any given time.
- C. One client can have more than one project.

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

- 1) A only
- 2) B only
- 3) C only
- 4) A and B only
- 5) B and C only

24. Which of the following is correct with respect to attributes of the relations?

- 1) Attributes gender, NIC and mobilePhoneNumber are candidate keys of programmer relation.
- 2) Attribute startDate is a derived attribute.
- 3) Attribute NIC can be considered as an alternate key for the programmer relation.
- 4) Attribute startDate is a foreign key for the workFor relation.
- 5) Each record in the workFor relation can be uniquely identified by using projectId.

25. Which of the following is correct?

- 1) All relations are in 3rd normal form.
- 2) All relations except the programmer are in the 3rd normal form.
- 3) All relations except the client are in the 3rd normal form.
- 4) All relations except the project are in the 3rd normal form.
- 5) All relations except the workFor are in the 3rd normal form.

26. Consider the following database constraints:

- A. Primary key
- B. Data type
- C. Foreign key

Which of the above constraint/s does/do not allow users to duplicate data in a database table?

- 1) A only
- 2) B only
- 3) A and B only
- 4) A and C only
- 5) B and C only

Consider the following four relational database tables to answer the following two questions.

item table

item	product
T001	Laptop
T002	TV
T003	Camera

supplier table

supplier	name
S001	BeLap Company Ltd.
S002	DigiTV trading company

itemSupplier table

item	supplier
T001	S001
T002	S001
T002	S002

delivery table

item	supplier	batch	quantity	date
T001	S001	B01	450	1.5.2015
T002	S001	AB1	45	1.5.2015
T001	S001	B02	500	2.5.2015
T001	S002	C01	75	5.5.2015

27. Which of the following actions is taken by a database management system when the SQL statement “delete from item” is executed?

- 1) It will ask the user to select records for deletion.
- 2) It may delete all the records from the “item” table.
- 3) It will drop the “item” table.
- 4) It will not delete any record from the “item” table.
- 5) The SQL statement will not be executed since it has errors.

28. Which of the following is correct with respect to the above tables?

- 1) All the tables are in 3rd normal form.
- 2) Normalization has been applied to these tables.
- 3) Integrity constraints are correctly applied to these tables.
- 4) There is no evidence to say that integrity constraints are properly applied.
- 5) Normalization and integrity constraints are properly applied.

2016 A/L

Consider the following relation to answer the following two questions.

Book (BN, title, publisher, version, author1, author2, author3) where BN is unique code.

29. Which of the following statements is correct with respect to the above relation?

- 1) It is in zero normal form.
- 2) It is in the 1st normal form.
- 3) It is in the 2nd normal form.
- 4) It is in the 3rd normal form.
- 5) Its normal form cannot be decided.

30. Which of the followings can be a candidate key of the above relation?

- 1) BN
- 2) Publisher
- 3) Version
- 4) Author1
- 5) Author2

31. Which of the followings is correct with respect to the term 'domain' in a relational database?

- 1) It is a set of possible names for a table.
- 2) It is a set of possible names for an attribute.
- 3) It is the collection of all possible primary keys.
- 4) It is the set of all possible values of an attribute.
- 5) It is the collection of foreign keys.

32. Which of the followings is correct with respect to the output of an SQL statement?

- 1) It generates an error if no data is available in the tables referred in the SQL statement.
- 2) It is always a table.
- 3) The order of the attributes in the output should be the same as the order of attributes in the table definition.
- 4) Outputs cannot be produced if the primary keys are not defined.
- 5) Names of the attributes in the output should be the same as the names in the table definition.

33. The length of an attribute defined using a Data Definition Language (DDL) statements is a/an constraint. Which of the followings is the most appropriate to fill the blank in the above statement?

- 1) Primary key
- 2) Foreign key
- 3) Null value
- 4) Domain
- 5) Application

34. Consider the following table in a relational database:

student	name	telephone	zscore
S0001	Dananjaya	0711118337	1.8
S0002	Saluka	0712227447	1.9
S0003	Upul	0713333882	2.0
S0004	Priyankara	0714445225	1.9
S0005	Supun	0715556446	2.1

What is the minimum number of SQL statements required to update all the values of the attribute z-score in the above table to 2.1?

- 1) 1
- 2) 2
- 3) 3
- 4) 4
- 5) 5

2017 A/L

Consider the following relation to answer following two questions:

Student (index_no, national_id_no, name, date_of_birth, gender, blood_group)
where index_no is a unique attribute and the name attribute fully depends on the index_no attribute.

35. Which of the following statements is correct with respect to the normal form of the above relation?

- 1) It is in the zero normal form.
- 2) It is in the first normal form.
- 3) It is in the second normal form.
- 4) It is in the third normal form.
- 5) Its normal form cannot be decided.

36. Which of the followings can be a candidate key of the above relation?

- 1) national_id_no
- 2) name
- 3) date_of_birth
- 4) gender
- 5) blood_group

Consider the following relations to answer following two questions:

book (book_no, title, publisher, edition)

author (author_id, name, email_address)

bookAuthor (book_no, author_id)

where book_no and author_id are unique attributes in the relations book and author respectively.

37. Which of the following statements is correct with respect to the relation bookAuthor?

- 1) book_no is the primary key.
- 2) author_id is the primary key.
- 3) Any single attribute can be a candidate key.
- 4) author_id is a candidate key.
- 5) book_no is a part of the primary key.

38. Which of the following Entity Relationship (ER) diagrams correctly represents the relationship between the entities represented by the above relations?


- 1) 


Diagram 1: A rectangular entity box labeled 'book' is connected to a diamond-shaped relationship box labeled 'write', which is in turn connected to a rectangular entity box labeled 'author'. The line between 'book' and 'write' is labeled '1', and the line between 'write' and 'author' is labeled 'm'.
- 2) 


Diagram 2: A rectangular entity box labeled 'book' is connected to a diamond-shaped relationship box labeled 'write', which is in turn connected to a rectangular entity box labeled 'author'. The line between 'book' and 'write' is labeled '1', and the line between 'write' and 'author' is labeled '1'.
- 3) 


Diagram 3: A rectangular entity box labeled 'book' is connected to a diamond-shaped relationship box labeled 'write', which is in turn connected to a rectangular entity box labeled 'author'. The line between 'book' and 'write' is labeled 'm', and the line between 'write' and 'author' is labeled '1'.
- 4) 


Diagram 4: A rectangular entity box labeled 'book' is connected to a diamond-shaped relationship box labeled 'write', which is in turn connected to a rectangular entity box labeled 'author'. The line between 'book' and 'write' is labeled 'm', and the line between 'write' and 'author' is labeled 'n'.
- 5) 

Diagram 5: A rectangular entity box labeled 'book' is connected to a diamond-shaped relationship box labeled 'write', which is in turn connected to a rectangular entity box labeled 'author'. The line between 'book' and 'write' is labeled 'm', and the line between 'write' and 'author' is labeled 'm'.

39. Assume that above relations are converted into tables in a relational database. The following SQL query is executed on the database:

```
SELECT * FROM bookAuthor
```

Which of the following statements is correct regarding the output of the above SQL query?

- 1) It cannot be an empty table.
- 2) Title column is in it.
- 3) Name column is in it.
- 4) All the tables book, author and bookAuthor are used to produce the output.
- 5) All records in the bookAuthor table are in the output.

40. Consider the following statements regarding the Data Definition Language (DDL) used to create the table bookAuthor while maintaining data integrity:

- A. It has a primary key constraint.
- B. It has a foreign key constraint.
- C. It has a domain constraint.

Which of the above statement/s is/are correct?

- 1) A only
- 2) A and B only
- 3) A and C only
- 4) B and C only
- 5) All A, B and C

2018 A/L

41. Consider the following statements regarding databases.

- A. Candidate key is a column, or a set of columns that can uniquely identify a row in a table.
- B. Alternate key is any candidate key that has not been selected as the primary key.
- C. Primary key can have a NULL value.

Which of the above statements is/are correct?

- 1) A only
- 2) B only
- 3) A and B only
- 4) A and C only
- 5) All A, B and C

42. Consider the following relational schema in a database.

Subject (SubjectID, TeamID, SubjectDescription)

Here the SubjectID, TermID, and SubjectDescription are ...and Subject is

Which of the following are most suitable to fill the blanks, respectively?

- 1) Attributes, a relation
- 2) Relations, an attribute
- 3) Tuples (records), a relation
- 4) Tuples, an attribute
- 5) Relations, a tuple

43. Consider the following statements regarding databases.

- A. For each attribute of a relation, there is a set of permitted values, called the domain of that attribute.
- B. The tuples (records) of the relations are always in sorted order.
- C. Database schema shows the organization of data as a blueprint of how the database is constructed.

Which of the above statements is/are correct?

- 1) A only
- 2) A and B only
- 3) A and C only
- 4) B and C only
- 5) All A, B and C

Consider the following relational schema consisting of text fields in answering questions 44 and 45.

Students (*admission_number*, *surname_with_initials*, *house_number*, *street_name*, *village*, *postal_town*, *postal_code*)

Assume that for a given *postal_town* only one *postal_code* exists.

44. Consider the following statements.

- A. *Students* relation is not normalized.
- B. *Students* is a relation in First Normal Form (1NF) only.
- C. In normalization terms, *Students* is a relation in Second Normal Form (2NF) and hence also in 1NF.

Which of the above statements is/are correct?

- 1) A only
- 2) B only
- 3) A and C only
- 4) B and C only
- 5) All A, B and C

45. Which of the following is displayed as output if the query:

*Select * from Students where postal_code = '10120' and house_number = '30A';*
is executed?

- 1) *Postal_code* of all records
- 2) *Postal_code* and *house_number* of records having *postal_code* as '10120' and *house_number* as '30A'
- 3) *Postal_code* and *house_number* of all records
- 4) All fields of records having *postal_code* as '10120' and *house_number* as '30A'
- 5) All fields of all records

46. Consider the following statements relating to Entity Relationship (ER) modeling.

- A. Cardinality specifies how many instances of an entity relates to one instance of another entity.
- B. An entity is a 'thing' or 'object' in the real world that can be identified separately (distinguishable) from all other objects.
- C. Cardinality specifies primary key attributes of an entity.

Which of the above is/are correct?

- 1) A only
- 2) A and B only
- 3) A and C only
- 4) B and C only
- 5) All A, B and C

2019 A/L

Consider the following database table to answer the questions 47 to 49.

Student_Sport		
Student_Id	Event_Id	Event_Name
10012	S-02	Carrom
10022	S-01	Basketball
10018	S-02	Carrom
10012	S-03	Volleyball
10025	S-04	Chess
10018	S-01	Basketball

47. In which normal form does the above table exist?

- 1) BCNF
- 2) First normal form
- 3) Second normal form
- 4) Third normal form
- 5) Zero normal form

48. Consider the following statements regarding the above table:

- A. It has a composite primary key.
- B. *Event_Name* attribute is fully dependent on the primary key of *Student_Sport* table.
- C. *Event_Id* is a candidate key.

Which of the above statements is/are correct?

- 1) A only
- 2) B only
- 3) A and B only
- 4) A and C only
- 5) All A, B and C

49. It is required to add a new field called **Age** to the *Student_Sport* table and the values of the new field must be greater than 10. Which one is the correct SQL statement to implement the above requirement?

- 1) Alter table Student_Suport add check (Age>10);
- 2) Alter table Student_Sport add where (Age>10);
- 3) Alter table Student_Sport set check (Age>10);
- 4) Update table Student_Sport add check (Age>10);
- 5) Update table Student_Sport add where (Age>10);

50. Which of the following SQL commands is not available in the Data Manipulation Language (DML)?

- 1) CREATE
- 2) DELETE
- 3) INSERT
- 4) SELECT
- 5) UPDATE

51. Consider the following statements regarding the Extended Entity Relationship (EER) model.

- A. EER model includes all the concepts of the original ER model.
- B. EER model has additional concepts of specialization/ generalization.
- C. EER model includes a new concept to model the weak entities.

Which of the above statement/s is/are correct?

- 1) A only
- 2) B only
- 3) A and B only
- 4) A and C only
- 5) All A, B and C

52. Consider the following SQL statement:

Update school set contact_person='Sripal W.' where school_id='04';

Which of the following is true when the above SQL statement is executed?

- 1) It adds an additional field with the name *contact_person* and adds value into that new field as 'Sripal W.' only in the records having *school_id*= 04
- 2) It adds an additional value to the *contact_person* as 'Sripal W.' only in the records having *school_id*= 04
- 3) It changes the field name of *contact_person* as 'Sripal W.' when selecting the records with *school_id*= 04
- 4) It changes the value of *contact_person* as 'Sripal W.' only in the records having *school_id*= 04
- 5) It selects all the records having *school_id*= 04 and *contact_person* as 'Sripal W.'

2020 A/L

53. What is the correct SQL statement to delete a database called 'ALdb'?

- 1) Delete ALdb;
- 2) Delete database 'ALdb';
- 3) Drop ALdb;
- 4) Drop database ALdb;
- 5) Remove database ALdb;

54. Which of the following statement/s about a relation in the Second Normal Form (2NF) are true?

- A. It can have a composite key.
 - B. It should be in the First Normal Form (1NF) as well.
 - C. All non-key attributes are fully functionally dependent on the primary key.
- 1) B only
 - 2) C only
 - 3) A and B only
 - 4) B and C only
 - 5) All A, B and C

55. Which of the following statement/s regarding the *logical database schema* are true?

- A. It is a blueprint for a database.
 - B. It contains data and information.
 - C. It formulates all the constraints that are to be applied on the data.
- 1) A only
 - 2) A and B only
 - 3) A and C only
 - 4) B and C only
 - 5) All A, B and C

55. Consider the following SQL statement:

Alter table subject add primary key (Subject_Id);

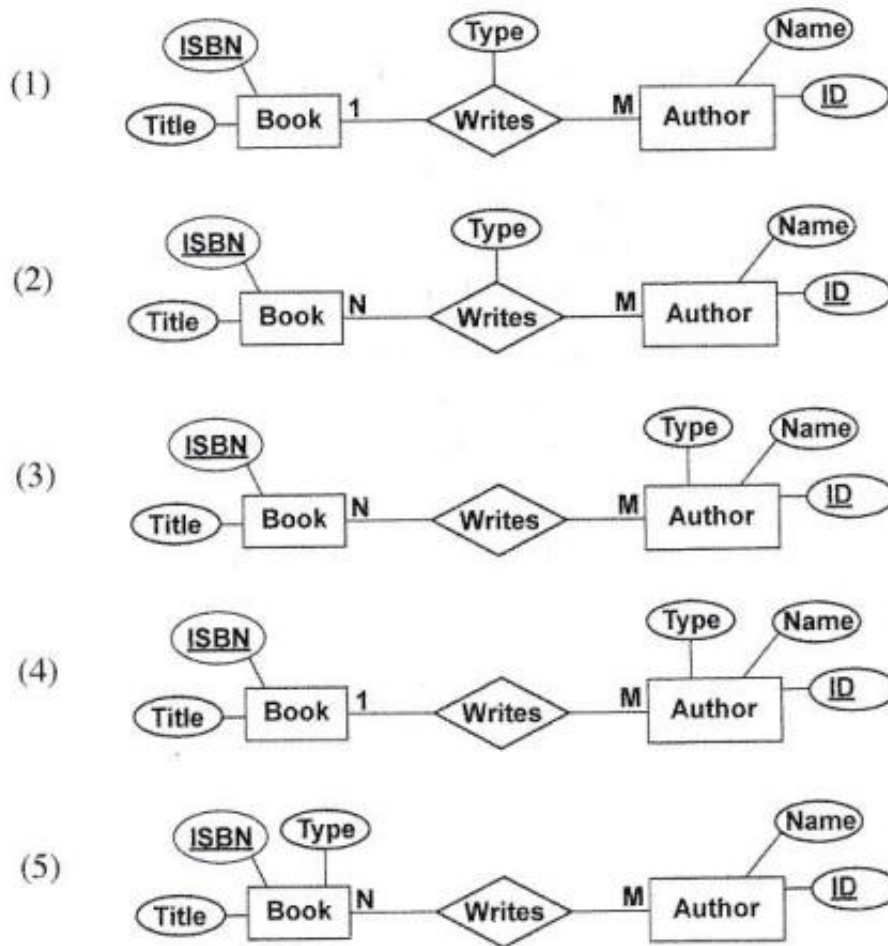
Which of the following is **incorrect** about the above SQL statement?

- 1) It adds a primary key constraint to the table names *subject*.
- 2) The table named *subject* should already exist.
- 3) A field *subject_id* should not be null.
- 4) A table named *subject* is created with a primary key named *Subject_Id*.
- 5) The values of the field *Subject_Id* should not be repeated in *subject* table.

58. Consider the following scenario about ‘authors’ and ‘books’ to answer the following questions.

“An author can write books. A book has a title and a code called ISBN which is unique. A book can be written by either one or several authors. An author has a name and a unique ID. An author has a name and a unique ID. An author can have a type as either chief author or a co-author for a particular book.”

56. Which of the following is the most suitable Entity Relationship (ER) representation for the above scenario?



57. How many tables can be derived initially, when mapping the entity relationships in the above scenario to a relational schema?

- 1) 1
- 2) 2
- 3) 3
- 4) 4
- 5) 5

2021 A/L

58. Which of the following is a (are) good practice (s) to follow in database development?

- A. The use of meaningful names for tables and fields
 - B. Letting different tables repeat the same information (other than the primary keys)
 - C. Avoiding a field and its table having the same name (in order to avoid confusion while writing queries)
- 1) A only
 - 2) B only
 - 3) C only
 - 4) A and B only
 - 5) A and C only

- Consider the following **Results** and **Subjects** tables to answer following questions.

Results

StudentNo	NIC	FirstName	SubjectID	Grade
S1234	986888457V	Nilam	ENG	B
S1447	992562321V	Praveena	PHY	C
S1234	986888457V	Nilam	ACC	A
S1323	900251452V	Thilan	ENG	S
S1323	900251452V	Thilan	ACC	B

Subjects

SubjectID	SubjectName
ENG	English
PHY	Physics
ECO	Economics
ACC	Accountancy

59. Which of the following is most suited to be selected as the *primary key* of the **Results** table with respect to the given details?
- 1) NIC
 - 2) SubjectID
 - 3) StudentNo
 - 4) StudentNo and NIC
 - 5) StudentNo and SubjectID
60. What is the correct SQL statement to retrieve the values of attributes **StudentNo**, **SubjectName** and **Grade**?
- 1) SELECT Result.StudentNo, Subjects.SubjectName, Results.Grade FROM Results INNER JOIN ON Results.SubjectID = Subjects.SubjectID;
 - 2) SELECT Result.StudentNo, Subjects.SubjectName, Results.Grade FROM Results INNER JOIN Results.SubjectID = Subjects.SubjectID;
 - 3) SELECT Result.StudentNo, Subjects.SubjectName, Results.Grade FROM Results INNER JOIN Subjects IN Results.SubjectID = Subjects.SubjectID;
 - 4) SELECT Result.StudentNo, Subjects.SubjectName, Results.Grade FROM Results INNER JOIN Subjects ON Results.SubjectID = Subjects.SubjectID;
 - 5) SELECT Result.StudentNo, Subjects.SubjectName, Results.Grade INNER JOIN Results AND Subjects Results.SubjectID = Subjects.SubjectID;
61. Which of the following is the correct statement about the **Results** table?
- 1) All the non-key attributes are fully functionally dependent on the primary key.
 - 2) It has one candidate key.
 - 3) It is in the *First Normal Form (1NF)*.
 - 4) It is in the *Second Normal Form (1NF)*.
 - 5) The cardinality of the table is four.
62. Which dependency is removed when converting the **Results** table to next normal form?
- 1) Foreign key dependency
 - 2) Fully functional dependency of non-key attributes on the primary key
 - 3) Multivalued dependency
 - 4) Partial dependencies of non-key attributes on the primary key
 - 5) Transitive dependency of non-key attributes

63. Following are the steps involved in creating an *Entity Relationship (ER) Diagram*:

- (i) Determine theA..... in your diagram.
- (ii) AddB..... to eachC.....
- (iii) Include theD..... between theA.....
- (iv) AddE..... to every relationship

Which of the following gives suitable choices for the A,B,C,D and E blanks in the above steps?

- 1) A-attributes, B- entities, C-attribute, D-cardinality, E-entities
- 2) A-attributes, B- cardinality, C-attribute, D -entities, E-entity
- 3) A- entities, B - attributes, C- entity, D -Relationships, E- cardinality
- 4) A- entities, B - Relationships, C- entity, D -attributes, E- cardinality
- 5) A- Relationships, B - cardinality, C- Relationship, D- attributes, E- entities

64. Which of the following can be modelled with an *Extended Entity Relationship* diagram?

- A. Subclasses of an entity
 - B. Inheritance of attributes
 - C. Specialization of entities
- 1) A only
 - 2) B only
 - 3) C only
 - 4) A and C only
 - 5) All A, B and C

A.

2011 A/L

1. Consider the following scenario.

Students in a school participate in different sports such as volleyball, track and field athletics, table tennis etc. The principal wants to maintain a registry with admission number, student name, home address, class and sports he/she participates. A student can participate in more than one sport. For a particular sport, there can be more than student. Each student can participate pre-defined number of hours in a sport.

- a. Draw an ER diagram for the above scenario.

- b. Classify with reasons whether the cardinality of relationship(s) identified in section (a) is one-to-one, one-to-many, or many-to-many.

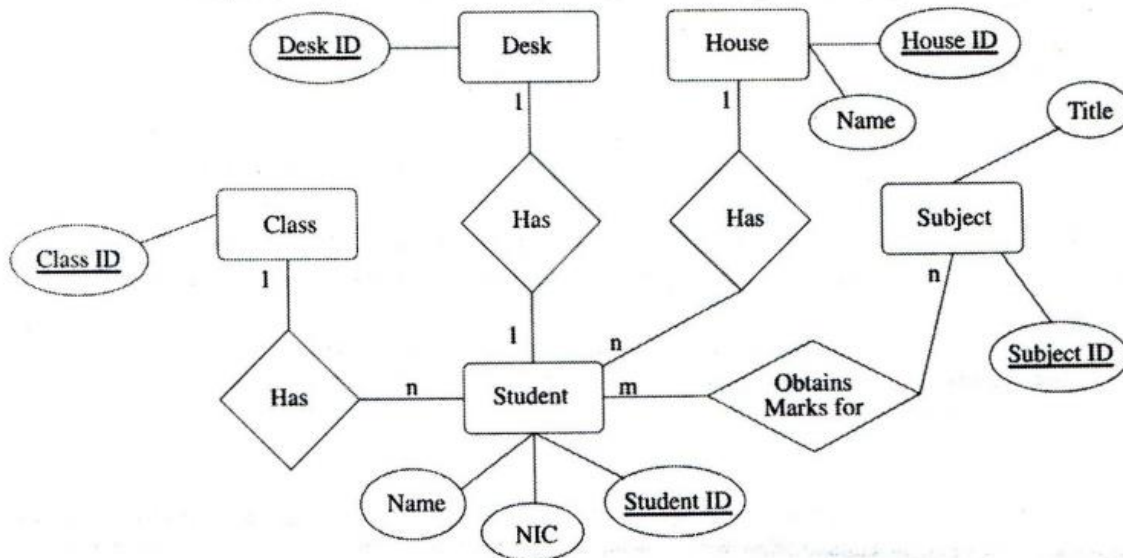
Relationship	Cardinality	Reason

- c. “ER diagram do not allow attributes to be assigned on relationship”. Status whether this statement in true or false. Explain your answer by using the given scenario.

- d. A database designer suggested the following relation for the above system. State two weaknesses of this relation and suggest necessary modifications.

AdmissionNo	StudentName	HomeAddress	Class	SportName

4. Consider the following ER diagram.



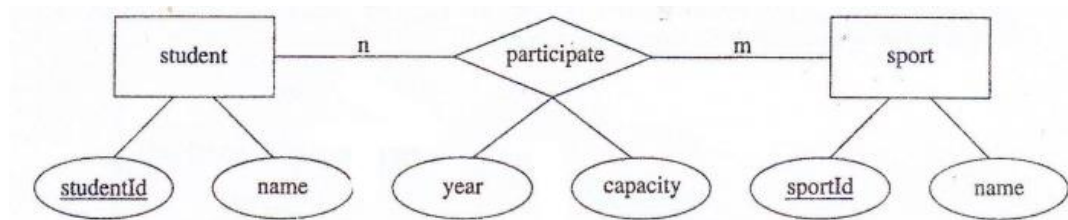
- State the **most relevant** entity or relationship in the above ER diagram to add an attribute to represent marks obtained by a student for a subject.
- Classify all the relationships in the above ER diagram as one-to-one, one-to-many or many-to-many. Justify your answer.
- Write the structure of the tables including their attributes when the above ER diagram is converted to a relational database.
- State the primary key for any table suggested in (c) above.
- Using the tables you have suggested in (c) above, write an SQL statement to get marks obtained for the subject with the value of Subject ID AL001 by the student with the value of Student ID ST001.

2013 A/L

1.

- Describe the relationship between a primary key and a foreign key in relational databases.

- b. Convert the following ER diagram to table structures in a relational database. The attribute capacity may have values such as captain, vice-captain, member etc.



- c. Based on the table structures obtained in section (b) above answer the following questions.
- Write an SQL statement to get a list of sports that do not have captains.
 - Write an SQL statement to obtain a list of students (studentId and name) who participate in any sport as a captain.

2.

Draw an Entity Relationship (ER) diagram to represent the scenario given below. The attributes and the primary keys of entities should be clearly indicated. State if any assumptions that you make clearly.

ABC cab Service Company **does not** own any car. Private car owners can register with the company and also rent their cars. Some car owners provide more than one car to the company. The company hires drivers for these cars. Any car available for rent can be driven by different drivers on different days. Car owners are responsible for maintenance of their cars in order to provide a reliable service to the customers. After completing each hire, the driver informs his current location to the company. When a customer requests a car, the company looks for the availability of a car in the vicinity of the calling area. If a car is available, company assigns that to the customer and informs both customer and the driver. The company tries its best to assign the nearest available car to the customer to make its services more efficient. The company keeps customer information such as name, address and the contact telephone number to provide a better service to their regular customers. The customers can also inform to the company whether they are happy with the services provided by the driver. This information is used when assigning drivers to the customers. Each car owner, car, driver and the customer are given "ownerId", "carId", "driverId", and the "custId" respectively to identify them uniquely.

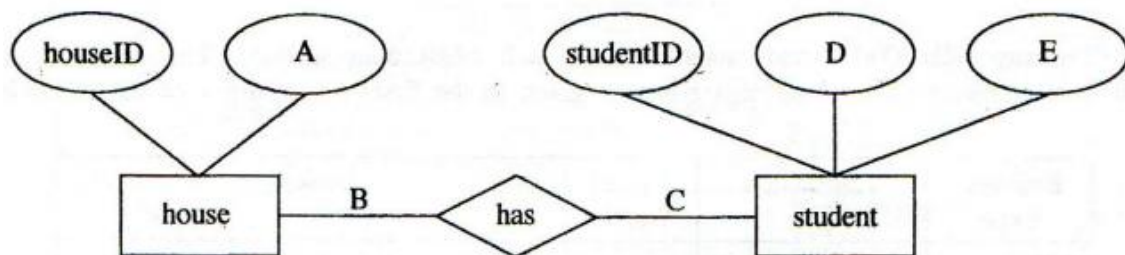
2014 A/L

1. You are given the following two tables in a relational database.

house	
houseID	name
HS1	Gamunu
HS2	Tissa
HS3	Wijaya
HS4	Parakum

student			
studentID	name	grade	houseID
STU001	Ranjith	13	HS1
STU002	Gopy	12	HS1
STU003	Vipula	12	HS2
STU004	Hakeem	11	HS3

- a. The above tables were created by converting the ER diagram given below.



Fill in the following blanks with the suitable labels or necessary information for the A,B,C,D and E shown in the ER diagram.

A -

B -

C -

D -

E -

- b. State whether the relationship between the tables student and house, is one-to-one, one -to many, or many -to-many. Justify your answer using suitable data from the above tables.
- c. Write the output of the following SQL statements based on the above tables, if any, otherwise state the error.
 - i. Select * from student where housed = 'HS3'
 - ii. Select studentID, houseID, name from student, house

Draw an Entity Relationship (ER) diagram to represent the scenario given below. In your diagram the attributes and the primary keys should be clearly indicated. Clearly state your assumptions, if any.

The EST University has three faculties: Education, Science, and Information Technology. Each faculty can offer one or more degree programs. The Faculty of Education and the Faculty of Science offer Bachelor of Education and Bachelor of Science degree programs respectively. However, the Faculty of Information Technology offers two degree programs: Bachelor of Science in Information Technology and Bachelor of Science in Software Engineering. At the time of the registration, students should pay the full degree program fee which may differ from one degree program to another. A student can enrol in only one degree program at a time. A degree program has two types of course units: compulsory and optional. A course unit can be available in more than one degree program. EST university has many lecturers. A lecturer can be assigned to one or more course units. A course unit can be assigned to one or more lecturers. Number of hours allocated for a course unit is distributed among the assigned lecturers when more than one lecturer is assigned to a course unit. Each faculty, degree program, course unit, lecturer, and student are uniquely identified by 'facultyID', 'degreeID', 'courseID', 'lecturerID' and 'studentID' respectively.

- (b) Consider the following Data Definition Language (DDL) statement to answer the questions b (i) and b (ii).

```
CREATE TABLE unit (
    instituteCode varchar(10) NOT NULL,
    unitCode varchar(10) NOT NULL,
    unitTitle varchar(50) DEFAULT NULL,
    PRIMARY KEY (instituteCode,unitCode),
    FOREIGN KEY (instituteCode) REFERENCES institute(instituteCode))
```

(i) What is the primary key of the above table?

(ii) What are the integrity constraints used in the above DDL?

- (c) Consider the following table:

index	name	address	class
1022	S.M.G.D. Dayasiri	No. 15, Peradeniya Road, Kandy	8 B
566	G.M.D. Priyangani	No. 147/7, Katugasthota Road, Kandy	11 C
923	F.D.C. Jayasingha	"Sadasiri", Colombo Road, Mawanella	10 B

(i) What is the cardinality of the above table?

(ii) What is the degree of the above table?

5. A pharmacy named "DR Chemists" sells drugs to patients. A patient should produce a prescription to a pharmacist at the pharmacy to buy drugs. A prescription has one or more drugs prescribed by a doctor. A doctor can issue more than one prescription for a patient. However, a prescription is issued by one doctor. Pharmacist prepares a bill for each prescription and gives it to the patient. Five (05) pharmacists at the pharmacy handle all prescriptions.

A pharmacist handles more than one prescription while one prescription is handled only by one pharmacist. The upper part of the prescription contains the patient information such as name, age, address and telephone number. The middle part of the prescription consists of one or more drug names, quantities to be issued and the dosages. At the bottom part name, address and telephone number of the hospital and the name of the doctor are available.

The owner of the pharmacy wants to keep the necessary information to prepare the following list of reports.

1. Number of prescriptions handled by each pharmacist.
2. Number of prescriptions issued by each doctor.
3. List of information about doctors, their hospitals and drugs prescribed by them.
4. List of daily cash collection of the pharmacy.

Prepare an ER diagram to model the data required to produce the above reports. State clearly all your assumptions, if any.

2016 A/L

1. State two possible problems faced by an information system having a relational database in zero normal form.

5. An education institute maintains a timetable to manage its lectures, practical classes and seminars. The timetable consists of two hour time periods: 8.00 a.m. - 10.00 a.m., 10.00 a.m. - 12.00 noon, 1.00 p.m. - 3.00 p.m. and 3.00 p.m. - 5.00 p.m. Lectures, practical classes and seminars are assigned to one or more time periods. A lecture is assigned to a lecturer and a practical class is conducted by a group of demonstrators. At least two lecturers are responsible for a seminar.

Draw an Entity Relationship (ER) diagram for the above system. State all your assumptions clearly.

- (b) The following SQL statement has been used to create a table in a database.

```
create table student(  
  student_no char(5),  
  name char(30),  
  address char(100),  
  primary key (student_no)  
)
```

- (i) Write a query in SQL to add the following data to the student table.

Student number – 10001

Name – Saman Kumara

Address – 78, Mahara road, Maharagama

.....

.....

.....

.....

.....

.....

- (ii) If the address of the student entered in the (i) above should be changed to 13, School Lane, Jaffna, write a query in SQL to update the relevant record in the student table.

.....

.....

.....

- (b) A person can own one or more mobile phones. One mobile phone belongs to a single person only. Assume that a mobile phone can be uniquely identified by its telephone number. National Identity Card number (NIC No) is used to identify a person uniquely. Above statements are represented by the ER diagram in Figure 4.2.

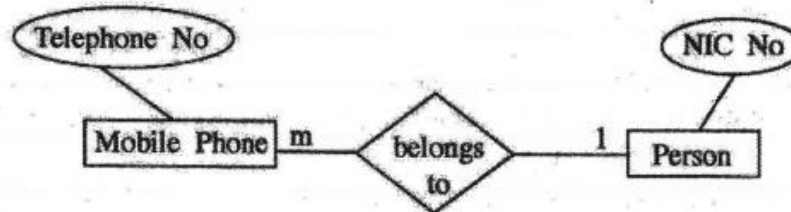


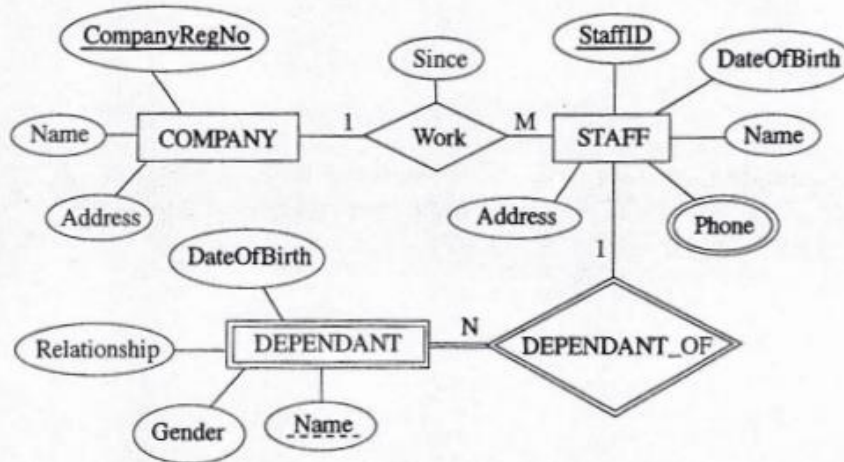
Figure 4.2: ER diagram

Convert the above ER diagram into 3rd Normal Form relations to be implemented in relational database.

5. The candidates who have been selected for university entrance should register for the given academic year with the university given to them. Candidates who do not register before the 'Last date' announced by each university will lose their university entrance. Once a candidate registers with the given university, the candidate becomes a registered student of that university. Registered students can apply for financial support, such as Mahapola scholarships and Bursary, separately. These financial supports could be either full or partial. All registered students will receive a laptop. However, its ownership cannot be transferred to another student. The user requirements of the above system are listed below. A user shall be able to obtain:
- (a) a list of students registered for a given academic year with a given university.
 - (b) information (such as model, serial number and warranty period) about the laptops given to each student.
 - (c) list of students who applied for financial support.

Draw an Entity Relationship (ER) diagram required to design a database to represent the above system description and to satisfy the user requirements. State all your assumptions clearly.

3. (a) Consider the following Entity Relationship (ER) diagram:



- (i) Briefly explain why the 'Phone' attribute is shown using a different symbol compared to other attributes.

.....

.....

- (ii) Briefly explain why DEPENDANT entity is shown using a different symbol compared to COMPANY.

.....

.....

- (iii) The following relational tables are constructed using the ER diagram shown above. In each of the tables, the field names are missing.

COMPANY (.....[Ⓟ].....)

STAFF (.....[Ⓠ].....)

STAFF_PHONE (.....[Ⓡ].....)

DEPENDANT (.....[Ⓢ].....)

Identify the missing field names in each table and write them down against Ⓟ - Ⓢ.

Ⓟ -

Ⓠ -

Ⓡ -

Ⓢ -

(iv) Write an SQL statement to display *Names* and *Addresses* of all the STAFF.

.....
.....

(v) Write an SQL statement to display the names of the dependants of staff member with StaffID = 'E001124'.

.....
.....

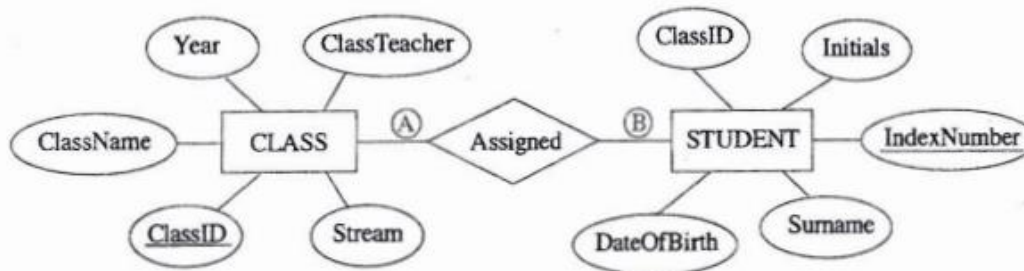
5. The following two tables CLASS and STUDENT are constructed by using the Entity Relationship (ER) diagram shown in Figure.

CLASS Table

ClassID	ClassName	ClassTeacher	Stream	Year
1111	12 - A	A. B. Perera	Physical Science	2017
1112	12 - B	N. Mohamed	Bio Science	2017
1113	13 - A	E. Selvadurai	Arts	2017
1114	13 - B	L. De Silva	Commerce	2018

STUDENT Table

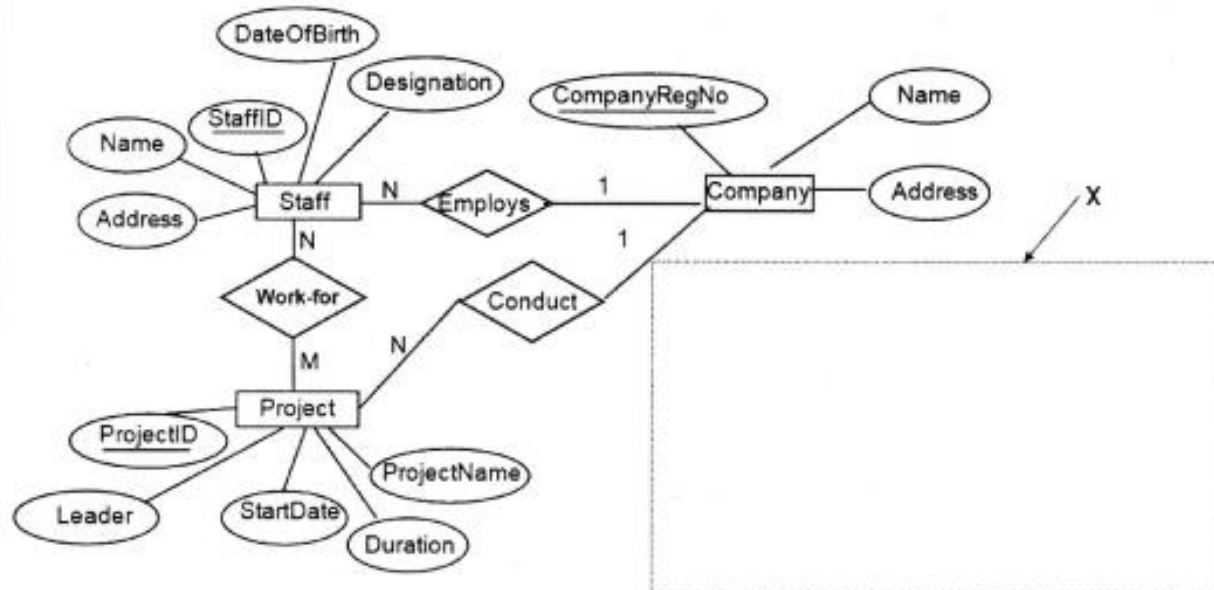
IndexNumber	ClassID	Initials	Surname	DateOfBirth
8991	1112	E.	Nazeer	1999.12.06
8993	1111	S.	Sivalingam	1999.02.06
8995	1112	W.	Fernando	1999.11.11
8997	1113	U. H.	De Silva	1999.08.06



- What is the cardinality of the relationship between the entities STUDENT and CLASS, denoted by (A) and (B) above? **Note:** Write down suitable labels for (A) and (B), respectively.
- Explain how a relationship is established between the two tables using primary key(s) and foreign key(s) in the above example.
- Are the two tables STUDENT and CLASS, in second normal form (2NF)? Explain a reason for your answer referring to tables.
 - Briefly explain one key advantage of *normalisation*.
- Write an SQL statement to insert the following record to the CLASS table:

1115	13 - C	A.B. Jinasena	Technology	2018
------	--------	---------------	------------	------

3. (a) Consider the following Entity Relationship (ER) diagram which represents the information about projects conducted by staff attached to a software development company.



- (i) The number of hours (*NoOfHours*) that each staff member works on each project is recorded.
Draw the attribute *NoOfHours* in the relevant position of the ER diagram with the correct symbol and the label.
- (ii) For each accepted project, a temporary location is rented for the staff, for the duration of the project. For each Location, the OwnerName, PhoneNo, Address, Rent, RentedDate and RentedPeriod are recorded. One project has only one location. A rented location is used for only one project. When a certain project is completed, the location rented for the project will be released and handed over to the owner.
Draw the Entity 'Location' with relevant attributes inside the area X in the diagram and link it to the existing ER diagram by indicating the cardinality.

5. A vehicle rental company has registered vehicle owners. Vehicles are obtained from the owners and rented to the customers. Consider the following relations regarding the vehicle rental company

- I. Customer (Customer_NIC, Customer_Name, City, Postal_Code)
- II. Vehicle_Owner (Owner_Id, Owner_Name, Contact_No)
- III. Vehicle(Vehicle_Reg_No, Description, Owner_Id)

- The Customer relation contains customer's national identity card number (NIC) which is unique, name, city where he/she is living and the postal code of the city. A customer lives in a single city and there are many customers in one city. The postal code depends on the city.
- The Vehicle_Owner relation contains the Owner_Id which is unique, owner's name and the contact number.
- The Vehicle relation contains the vehicle registration number which is unique, a description about the vehicle and the Owner_Id.

A customer can rent more than one vehicle. Also, it is possible to rent one vehicle to many customers at different instances. Each vehicle is owned by one owner and one owner can have more than one vehicle.

- (a) In which *normal form* do the above relations given in I, II, III above exist? Justify your answer.
- (b) Convert the above relations to the next *Normal Form* from the current *Normal Form* which you have stated in 5(a). (Present the contents relevant to the labels \textcircled{P} to \textcircled{U} indicated in the following table as your answer.)

Relation No.	Next Normal Form	Relation/s in Next Normal Form
I	\textcircled{P}	\textcircled{S}
II	\textcircled{Q}	\textcircled{T}
III	\textcircled{R}	\textcircled{U}

- (c) Draw an Entity Relationship (ER) diagram to depict the above relations by identifying the relationships, key attributes, other attributes and the cardinality.
- (d) It is necessary for the company to keep the details of renting vehicles by customers. Create a relation called "Rent", including the details Rent_Date, Start_Time and End_Time.
- (e) Write an SQL statement to select Owner_Id and Vehicle_Reg_No of all the vehicles owned by each vehicle owner.

9. (a) Consider the following description relating to details of players attached to different sports clubs. A player always belongs to a sports club and he/she can be identified uniquely by the NIC (National Identity Card) number. Further a player has a name which consists of a surname and initials.

A club which is uniquely identified by its name can have many players. A player can play games. Each game in this context is given a unique code and a description. A player can play more than one game and each game is played by at least one player.

Note : Use only the relevant words in the above description when drawing the Entity-Relationship (E-R) diagrams for the following questions.

- (i) Draw an ER diagram for the above description.
 - (ii) Extend the ER diagram in above (i) to include the number of hours played by each player for each game.
 - (iii) Player may have a sponsor who has a unique title. A sponsor can give sponsorship only for one player. Extend further the ER diagram in part (ii) above to include the sponsor's details.
- (b) The 'Winner' table given below contains the details of the players who won different matches and medals. There is a fixed amount of prize money given to each medal type. A Gold medal has Rs. 20,000/=, a Silver medal has Rs. 10,000/= and a Bronze medal has Rs. 5,000/=.
- Consider the primary key of the Winner table as NIC and MatchID.

Winner Table

NIC	MatchID	MedalType	Prize
951477751V	BD-2	Silver	10000
985467923V	BD-2	Gold	20000
995874159V	BD-1	Gold	20000
997656614V	BD-3	Silver	10000
951477751V	BD-1	Bronze	5000

- (i) Write an SQL statement to display the number of players who won "Gold" medals.
- (ii) In which normal form does the above table exist? Justify your answer.
- (iii) Convert the above table to the next normal form. (It is **not required** to write the data in the tables derived in next normal form.)

9. (a) A **virtual** supermarket has registered suppliers to supply the customer orders placed online. The supermarket always fulfils its customer orders through these suppliers. One supplier is responsible only for the customers who live in the supplier's area. A customer has only one supplier. Each supplier is characterized by a code (unique), address and contact numbers. A supplier can have several contact numbers.

Each customer is characterized by an email address (unique), name and location.

A customer can confirm orders. Each order has only one supplier and one customer.

An order is characterized by an order number (unique), description and a value. A supplier can supply more than one order.

Note: Use only the terms from the list given below for your ER diagrams of parts (i) and (ii).

List: {address, agent, code, confirms, contactNo, customer, description, email, hires, location, name, order, orderNo, supplier, supplies, value}

(i) Draw the Entity Relationship (ER) diagram for the above description. [07 marks]

(ii) Sometimes suppliers hire agents to support the order supplies. However, the supermarket identifies the agents only through registered supplier codes. An agent is characterized by a name and a contact number. Each agent is working only for one supplier and a supplier is also getting only one agent's service.

Add these details to the ER diagram you drew for part (i). [04 marks]

- (b) A building construction company signs contracts with its clients. Each contract is handled by an agent of the company.

The **Contracts** table contains the details of the contracts. It has contract number, agent's code, name and mobile phone number represented with **CNo**, **ACode**, **AName** and **AMobile** attributes respectively. The client's name is represented with **Client**. Primary key of the **Contracts** table is **CNo**.

Contracts

CNo	ACode	AName	AMobile	Client
C-112	EP003	Anura	0714545866	Srimal
C-103	EP006	Navod	0774511320	Abish
C-116	EP003	Anura	0714545866	Nehara
C-224	EP015	Virah	0763538147	Srimal

(i) Write an SQL statement to change in the **Contracts** table, the mobile number of the agent whose agent code is EP003 to 0772222222. [01 mark]

(ii) In which normal form does the **Contracts** table exist? [01 mark]

(iii) Convert the **Contracts** table into next normal form. (It is **not** necessary to write the data in derived relations in the next normal form.) [02 marks]

