

TEST YOUR KNOWLEDGE

True/False

1. When transforming an E-R model into a relational database design, each entity is represented as a table.
2. The E-R model refers to a specific table row as an entity occurrence.
3. Attributes are types of entities.
4. A composite key is a primary key composed of more than one attribute.
5. All attributes are either simple or composite.
6. All simple attributes are also single-valued.
7. Composite attributes cannot be further subdivided.
8. A multivalued attribute can have lower and upper bounds.
9. An attribute value can be derived from another attribute.
10. The names on entity types and entity sets are different.
11. An entity cannot have more than one key attribute.
12. A relationship type of degree two is called as ternary relationship.
13. Relationship types can also have attributes.
14. The attribute of a relationship type can be added to participating entity types.
15. A weak entity type can have more than one identifying entity type.
16. The number of levels of weak entity types cannot be more than one.
17. The E-R model is high-level conceptual model.
18. Derived attributes are stored in a special database table.
19. Cardinality expresses the specific number of entity occurrences associated with every occurrence of a related entity.
20. All entity relationships can be characterized as weak or strong.
21. A weak entity has a primary key that is partially or totally derived from the parent entity in the relationship.
22. The underlined attribute in E-R diagram represents a primary key.
23. A domain is a set of composite values.
24. A domain need not be given a format.
25. It is possible for several attributes to have same domain.
26. An E-R diagram with m entities and n relationships will translate to $m+n$ tables.
27. If E is a weak entity set, then its key can only be the key attributes of E 's supporting entity sets.

Fill in the Blanks

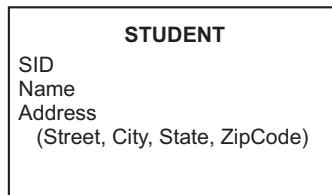
1. Attributes that are not divisible are called _____.
2. When the value of an attribute A is obtained from the value of an attribute B , then the attribute A is called _____.
3. _____ are characteristics of entities.
4. _____ specifies the set of values that can be assigned to the attribute.

5. The partial key attribute is underlined with a _____ line.
6. A person's social security number would be an example of a(n) _____ attribute.
7. _____ attributes can be subdivided.
8. A(n) _____ attribute cannot be subdivided.
9. An attribute representing one or more bank accounts belonging to a person would be a(n) _____ attribute.
10. It is better to store the date of birth and use the difference between that value and the system date as a(n) _____ attribute, rather than storing a person's age.
11. An entity type without a key attribute is called _____ entity type.
12. A(n) _____ attribute need not be physically stored within the database.
13. A(n) _____ relationship is also known as an identifying relationship.
14. A weak entity must be _____-dependent.
15. The relationship in which an entity type participates more than once is a _____ relationship.
16. If one entity occurrence does not require a corresponding entity occurrence in a particular relationship then participation is _____.
17. If you are unable to understand the distinction between mandatory and optional _____ in relationships, then it might yield designs containing unnecessary temporary rows to accommodate the creation of required entities.
18. A(n) _____ relationship exists when three entities are associated.
19. By identifying the attributes of the entities, you can better understand the _____ among entities.
20. The most serious drawback in the ER model is that it cannot depict _____.
21. A weak entity type always has a _____ participation constraint with respect to its identifying relationships.
22. The entity types are represented in ER-diagrams by _____.
23. The relationships are displayed as _____ in ER-diagrams.
24. The multivalued attributes are represented in ER-diagrams by _____.
25. _____ specifies the maximum number of relationship instances that an entity can participate.

Multiple Choice Questions

1. A person's name, birthday, and social security number are all examples of
 (a) Entities (b) Attributes (c) Relationships (d) Descriptions
2. An attribute that can be broken down into smaller parts is called a(n) _____ attribute.
 (a) simple (b) associative (c) complex (d) composite
3. Which of the following criteria should be considered when selecting an identifier?
 (a) Choose an identifier that will not be null.
 (b) Choose an identifier that doesn't have large composite attributes.
 (c) Choose an identifier that is stable.
 (d) All of the above.
4. A relationship where the minimum and maximum cardinality are both one is a(n) _____ relationship.
 (a) optional (b) mandatory link (c) unidirectional (d) mandatory one

5. Which statement is false?
- (a) Each attribute of a relation has a name.
 - (b) Attribute values are (normally) required to be atomic.
 - (c) The special value null is a member of every domain.
 - (d) None of above
6. Customers, cars, and parts are examples of
- (a) entities
 - (b) attributes
 - (c) relationships
 - (d) cardinals
7. The following figure shows an example of



- (a) a composite attribute
 - (b) a multivalued attribute
 - (c) a relational attribute
 - (d) a derived attribute.
8. Which is false?
- (a) Relationship type is grouped by the same type of relationship instances.
 - (b) The current state of a relationship type is the relationship set.
 - (c) Relationship type identifies the relationship name and the participating entity types.
 - (d) Relationship type identifies certain relationship constraints.
9. Which is false?
- (a) A relationship can have one or more attributes.
 - (b) A weak entity must participate in an identifying relationship type with an owner or identifying entity type.
 - (c) Cardinality ratio specifies maximum participation.
 - (d) An attribute relate two entities.
10. A student can attend 5 courses. Different professors can offer the same courses. The relationship of students to professors is a _____ relationship.
- (a) many-to-many
 - (b) one-to-many
 - (c) one-to-one
 - (d) many-to-one
11. In an E-R, Y is the dominant entity and X is a subordinate entity. Then which of the following is incorrect:
- (a) Operationally, if Y is deleted, so is X
 - (b) Existence is dependent on Y
 - (c) Operationally, if X is deleted, so is Y
 - (d) Operationally, if X is deleted, and remains the same.
12. When an E-R diagram is mapped to tables, the representation is redundant for
- (a) weak entity sets
 - (b) weak relationship sets
 - (c) strong entity sets
 - (d) strong relationship sets.
13. When we map a multivalued attribute for entity E from the ER model to the relational model, we will create

- (a) many relations, one for each of the distinct values of the attribute
 - (b) one relation that contains a foreign key and a column for the attribute
 - (c) a column in the relation that represents the entity E
 - (d) none of the above .
14. The ERD is used to graphically represent the ____ database model
- (a) Condensed
 - (b) Physical
 - (c) Logical
 - (d) Conceptual.
15. An entity type having the or more parent entity type that themselves subclass entity-types within the same classification hierarchy is called
- (a) Shared subclass
 - (b) Associative subclass
 - (c) Subclass assistant
 - (d) Entity type.
16. The set of possible values for an attribute is called a
- (a) domain
 - (b) range
 - (c) set
 - (d) key.
17. Weak entities can alternatively be modelled as a repeating group of
- (a) Employees
 - (b) Nodes
 - (c) Attributes
 - (d) Parent entity
18. The ideal number of attributes used to make up a primary key is ____.
- (a) zero
 - (b) one
 - (c) two
 - (d) six
19. Which of the following key consists of more than one attribute?
- (a) Primary
 - (b) Foreign
 - (c) Composite
 - (d) Domain.
20. Which of the following attribute can be further subdivided to yield additional attributes?
- (a) Composite
 - (b) Simple
 - (c) Single-valued
 - (d) Multivalued
21. Basic entity-relationship modelling and normalization techniques capture only the
- (a) Modelling of complex and unstructured data types
 - (b) Structure and static relationships of structured data
 - (c) Dynamic and complex relationship of structured data
 - (d) Concept of modelled data
22. In an E-R diagram relationship is represented by
- (a) circles
 - (b) rectangles
 - (c) diamond shaped box
 - (d) ellipse.
23. One entity may be
- (a) related to only one other entity
 - (b) related to itself
 - (c) related to only two other entities
 - (d) related to many other entities.
24. Some attributes are classified as
- (a) Simple
 - (b) Complex
 - (c) Defined
 - (d) Grouped.
25. Which of the following might be represented with a multivalued attribute?
- (a) Person's name
 - (b) Household phone numbers
 - (c) Bank account balance
 - (d) Book title.
26. Which of the following might be represented with a single-valued attribute?
- (a) Person's phone number(s)
 - (b) Car's color
 - (c) Employee's educational background
 - (d) Person's social security number.

27. Which of the following type of attribute cannot be created in a DBMS?
(a) Derived (b) Multivalued (c) Simple (d) Composite.
28. Which of the following should be a derived attribute?
(a) Person's name (b) Person's age
(c) Person's social security number (d) Person's phone number.
29. A derived attribute
(a) must be stored physically within the database
(b) need not be physically stored within the database
(c) has many values
(d) must be based on the value of three or more attributes
30. A relationship is an association between
(a) objects (b) entities (c) databases (d) fields.
31. Knowing the ____ number of entity occurrences is very helpful at the application software level.
(a) Maximum (b) Minimum (c) Exact (d) Both (a) and (b)
32. In the ERD, cardinality is indicated using the ____ notation.
(a) (max, min) (b) (min, max) (c) [min ... max] (d) {min | max}
33. Making sure all ____ are identified is a very important part of a database designer's job.
(a) business rules (b) cardinalities
(c) derived attributes (d) relationships
34. By relation cardinality we mean
(a) number of items in a relationship
(b) number of relationships in which an entity can appear
(c) number of items in an entity
(d) number of entity sets which may be related to a given entity
35. When the PK of one entity does not contain the PK of a related entity, the relationship is
(a) missing (b) weak (c) strong (d) neutral
36. If an entity's existence depends on the existence of one or more other entities, it is said to be ____-dependent.
(a) existence (b) relationship (c) business (d) weak
37. A student can take not more than 5 subjects in a semester. The number of students allowed in a subject in a semester is not more than 40. The student – subject relationship is
(a) 5 : 40 (b) 40 : 5 (c) N : 5 (d) 40 : M
38. Which of the following entity has a primary key that is partially derived from the parent entity in the relationship?
(a) strong (b) weak (c) business (d) relationship
39. The term "____" is used to label any condition in which one or more optional relationships exist.
(a) Participation (b) Optionality (c) Cardinality (d) Connectivity
40. The existence of a(n) ____ relationship indicates that the minimum cardinality is 1 for the mandatory entity.
(a) mandatory (b) optional (c) multivalued (d) single-valued

41. If an employee within an EMPLOYEE entity has a relationship with itself, that relationship is known as a ____ relationship.
- (a) self (b) self-referring (c) looping (d) recursive
42. If an entity appears in N relationships then it is
- (a) a 1 : 1 relationship (b) a 1 : N relationship
(c) a N : 1 relationship (d) a N : M relationship
43. Assume we want to map a 1 : N relationship type, which involves entity types R and S, where R is on the N side of the relationship type and S is on the 1 side, to the relational model. The attributes of the relationship type should be mapped to attributes of
- (a) the corresponding relation for the entity type R
(b) the corresponding relation for the entity type S
(c) the corresponding relations for both entity types R and S
(d) none of the above
44. A weak entity type
- (a) must have total participation in an identifying relationship
(b) does not have a key attribute(s)
(c) both (a) and (b)
(d) none of the above
45. Which of the following relationships are most common?
- (a) Unary (b) Binary (c) Ternary (d) Higher degree
46. Which of the following statements best describes the function of an entity relation model?
- (a) An ER model is concerned primarily with a logical view of the data and secondly with the physical implementation
(b) An ER model is concerned primarily with a physical implementation of the data and secondly with the logical view
(c) An ER model provides a view of the logic of the data and not the physical implementation
(d) An ER model is entirely concerned with modelling the physical implementation
47. A many-to-many relationship from an ER diagram can be represented in the relational model by a ____
- (a) domain (b) primary key
(c) relation with two foreign keys (d) a single attribute
48. Which of the following step occurs first in the process of building an ERD?
- (a) Develop the initial ERD.
(b) Create a detailed narrative of the organization's description of operations.
(c) Identify the attributes and primary keys that adequately describe the entities.
(d) Identify the business rules based on the description of operations.
49. Which of the following complex requirements may dictate data transformations, and they may expand the number of entities and attributes within the design?
- (a) Information (b) Entity (c) Design (d) Processing
50. Which of the following do you create first when creating a database?
- (a) Primary keys (b) Foreign keys (c) Data dictionary (d) All of the above

51. Consider the following figure representing instances of a relationship between employees and the department that the employees work in.

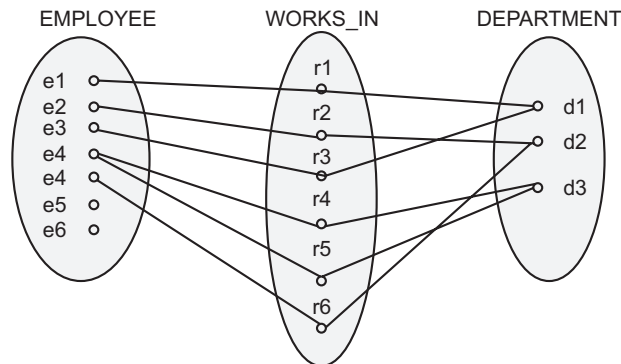


FIGURE 2.46

Which of the following relationships are represented by the above figure?

- (a) 1 : 1 Cardinality Ratio between EMPLOYEE and DEPARTMENT and total participation from EMPLOYEE and total participation from DEPARTMENT
- (b) 1 : N Cardinality Ratio between EMPLOYEE and DEPARTMENT and partial participation from EMPLOYEE and partial participation from DEPARTMENT
- (c) M : N Cardinality Ratio between EMPLOYEE and DEPARTMENT and partial participation from EMPLOYEE and total participation from DEPARTMENT
- (d) N : 1 Cardinality Ratio between EMPLOYEE and DEPARTMENT and total participation from EMPLOYEE and total participation from DEPARTMENT
52. The entity type on which the _____ type depends is called the identifying owner.
- (a) Strong entity (b) Relationship (c) Weak entity (d) E-R (UGC-NET)
53. Suppose we map the following ER diagram to the relations E1(A, B) and E2(B, C). The create table statement for E2 is defined as the following: Create table E2(B integer primary key, C integer). Which one of the following create table statement would be correct for E1?
- (a) Create table E1(A integer primary key, B integer not null)
- (b) Create table E1(A integer unique, B integer references E2)
- (c) Create table E1(A integer primary key, B integer not null references E2)
- (d) Create table E1(A integer, B integer)
54. For the following ER diagram, we map the relationship, R, to a relation with attributes A, B and C. How many times can any specific combination of values for attributes A and B occur in that relation?

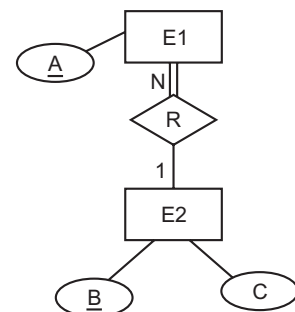


FIGURE 2.47

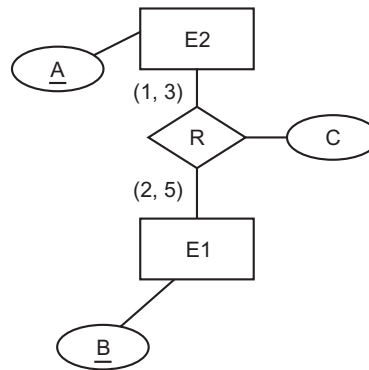


FIGURE 2.48

- (a) 1 (b) 3 (c) 5 (d) 15

55. Which of the following relational database schemes is a correct representation (via the mapping steps from the text) for the following ER diagram?

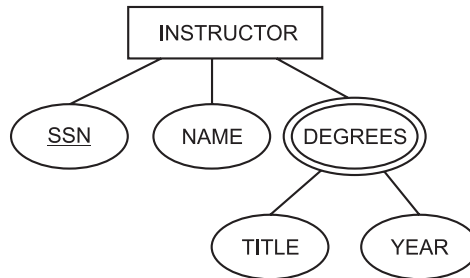


FIGURE 2.49

- (a) INSTRUCTOR(SSN,NAME) DEGREES(SSN,TITLE,YEAR)
 (b) INSTRUCTOR(SSN,NAME,TITLE,YEAR)
 (c) INSTRUCTOR(SSN,NAME) DEGREESA(SSN,TITLE) DEGREESB(SSN,YEAR)
 (d) None of the above
56. The E-R model is expressed in terms of (UGC-NET)
 (i) Entities
 (ii) The relationship among entities
 (iii) The attributes of the entities.
 Then
 (a) (i) and (iii) (b) (i) and (ii) (c) (ii) and (iii) (d) none of these
57. An entity-relationship diagram is a tool to represent (UGC-NET)
 (a) Data model (b) Process model (c) Event model (d) Customer model
58. A primary key for an entity is (UGC-NET)
 (a) A candidate key (b) Any attribute
 (c) A unique attribute (d) A superkey
59. An entity instance is a single occurrence of an (UGC-NET)
 (a) Entity type (b) Relationship type

- (c) Entity and relationship type (d) None of these
60. An entity has (UGC-NET)
- (i) a set of properties
 - (ii) a set of properties and values for all the properties
 - (iii) a set of properties and the values for some set of properties may non-uniquely identify an entity
 - (iv) a set of properties and the values for some set of properties may uniquely identify an entity.
- Which of the above are valid?
- (a) (i) only (b) (ii) only (c) (iii) only (d) (iv) only

ANSWERS

True/False

- | | | |
|-------|-------|-------|
| 1. T | 2. T | 3. F |
| 4. T | 5. T | 6. F |
| 7. F | 8. T | 9. T |
| 10. F | 11. F | 12. F |
| 13. T | 14. T | 15. T |
| 16. F | 17. T | 18. F |
| 19. F | 20. T | 21. T |
| 22. T | 23. F | 24. F |
| 25. T | 26. F | 27. F |

Fill in the Blanks

- | | | |
|-------------------|-------------------|-------------------------|
| 1. atomic | 2. derived | 3. Attributes |
| 4. Domain | 5. dotted | 6. single-valued simple |
| 7. Composite | 8. simple | 9. multivalued |
| 10. derived | 11. weak | 12. derived |
| 13. strong | 14. existence | 15. recursive |
| 16. optional | 17. participation | 18. ternary |
| 19. relationships | 20. relationships | 21. total |
| 22. rectangles | 23. diamonds | 24. double ovals |
| 25. Cardinality | | |

Multiple Choice Questions

- | | | |
|---------|---------|---------|
| 1. (b) | 2. (d) | 3. (d) |
| 4. (d) | 5. (d) | 6. (a) |
| 7. (a) | 8. (b) | 9. (d) |
| 10. (a) | 11. (c) | 12. (b) |
| 13. (b) | 14. (d) | 15. (a) |

- | | | |
|---------|---------|---------|
| 16. (a) | 17. (d) | 18. (b) |
| 19. (c) | 20. (a) | 21. (b) |
| 22. (c) | 23. (d) | 24. (a) |
| 25. (b) | 26. (d) | 27. (b) |
| 28. (b) | 29. (b) | 30. (b) |
| 31. (d) | 32. (b) | 33. (a) |
| 34. (b) | 35. (b) | 36. (a) |
| 37. (b) | 38. (b) | 39. (b) |
| 40. (a) | 41. (d) | 42. (b) |
| 43. (a) | 44. (c) | 45. (b) |
| 46. (c) | 47. (c) | 48. (b) |
| 49. (a) | 50. (c) | 51. (c) |
| 52. (c) | 53. (c) | 54. (a) |
| 55. (a) | 56. (b) | 57. (a) |
| 58. (c) | 59. (a) | 60. (d) |

EXERCISES

Short Answer Questions

1. What is entity? Give some examples.
2. What is attributes? Give some examples.
3. What is domain? Give an example.
4. What is entity set? Give an example.
5. Give names of various types of attributes.
6. What is simple attribute? Give an example.
7. What is composite attribute? Give an example.
8. Explain the difference between simple and composite attributes. Provide at least one example of each.
9. What is single valued attribute? Give an example.
10. What is multivalued attribute? Give an example.
11. What is the difference between single valued and multivalued attribute?
12. What is stored attribute? Give an example.
13. What is derived attribute? Give an example.
14. What is the difference between derived attribute and stored attribute?
15. What is an entity-relationship diagram and how is it read?
16. What is relationship?
17. What is relationship set? Give an example.
18. What is the degree of relationship set?
19. What are three types of data relationships?
20. What is required of two tables in order for the tables to be related?

21. What is binary relationship set? Give an example.
22. What is ternary relationship set? Give an example.
23. What is recursive relationship set? Give an example.
24. What is role? Give an example.
25. What is mapping constraints?
26. What is mapping cardinalities?
27. Explain various types of mapping cardinalities.
28. What are participation constraints?
29. What is a key?
30. Give names of various keys.
31. What is candidate key? Give example.
32. What is primary key? Give example.
33. What is foreign key? Give example.
34. What are the various symbols of ER diagram?
35. What are the limitations of ER diagram?
36. What is strong entity set? Give an example.
37. What is weak entity set? Give an example.
38. What is a logical data model? Identify some methods used to translate an entity-relationship diagram into a data model.
39. What is an integrity constraint? What are the five types of integrity constraints?
40. Is an attribute that is single-valued always simple? Why or why not?
41. What is a weak relationship? Provide an example.
42. What is a ternary relationship? Give some examples of business rules that specify the need for a ternary or higher-order relationship.
43. Is an E-R diagram with m entities and n relationships will translate to $m+n$ tables.
Ans. No, many-to-one relationships can often be merged and therefore reduce the overall number of tables needed.
44. If E is a weak entity set, then its key can only be the key attributes of E 's supporting entity sets.
Ans. No, the key of E can contain its own attributes as well.
45. What is EER model?
46. What is supertype? Give an example.
47. What is subtype? Give an example.
48. What is specialization? Give an example.
49. What is generalization? Give an example.
50. What is attribute inheritance? Give an example.
51. What is aggregation? Give an example.
52. What are participation constraints?
53. What is partial participation? Give an example.
54. What is total participation? Give an example.
55. What are disjoint constraints? Give an example.

56. What is categorization? Give an example.
57. What are the steps to convert an ER diagram into tables?
58. A timetable database is required for a University Department. Each taught event is part of a module, each event will have exactly one member of staff associated and several individual students. Each event takes place in a single weekly time slot. Each time slot has a day of the week and a time of day associated. Each of the weekly time slots is exactly one hour long, however we wish to represent the fact that some events take more than one hour. Which of the following does not represent a possible solution AND why?
- A many-to-many relation between events and time-slots is established
 - A one-to-many relation between events and time-slots is established
 - Each event has an attribute "start" which refers to time-slots and "duration" which gives the length of the event in minutes
 - Each event has an attribute "start" which refers to time-slots and "duration" which gives the number of slots spanned
 - Each event has two attributes "first" and "last" each of which refer to time-slots

Ans. B, Currently the relation only consists of a start time, and it is believed to last 1 hour. The addition of a 1 : N relationship means that a single event can have multiple time-slots, and thus we can now imply how long the event takes and thus satisfy the new criteria. It however stops more than one event happening at the same time, which would severely weaken the timetable.

59. Is it possible for a relationship to be declared many-one and be symmetric? A symmetric relation is one that is its own inverse. Under what conditions would this be true?

Ans. A relationship that is declared M-O can be symmetric only if

- it runs from an entity set to itself and
- it is actually one-one

60. Consider the ER diagram shown below where A, B and C are entity sets.
- Specify the condition(s) that is(are) necessary in order to represent all three sets with a single table.
 - Now specify the condition(s) that is(are) necessary in order to represent all three sets with two tables, one for B and one for C.

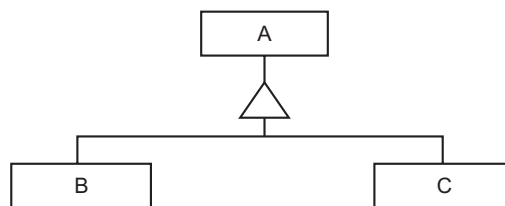


FIGURE 2.50

Ans. (a) The ISA relationship must be disjoint. B and C must have the same attributes.

(b) The ISA relationship must be total.

61. Suppose we define a database about the customers of a bank and the loans they have received from the bank. For each customer we need to record information about their name, address, phone number and the company they work for. For each loan we need to record the amount, the interest rate, date the loan was issued, and the date the loan should be paid off.

- (a) Is it a good idea to represent the company for which a customer works as an attribute of the customer or as a relationship? Briefly justify your answer.
- (b) Which is the best way to represent the relationship between the customer and their loans: by defining the loan as an attribute of the customer, or - by making the loan a separate entity set and defining a relationship set between it and the customer?

Ans. (a) The Company should be an attribute of the customer, assuming each customer works for a single company. We don't need to keep any information for each company.

(b) The loan should be a separate entity set associated with a customer through a relationship for the following reasons:

- (i) A customer may have more than one loans.
- (ii) A loan has additional information on its own.

Long Answer Questions

1. Explain the difference between a weak and a strong entity set. Why do we have the concept of weak entity set?
2. Explain the meaning of following with suitable examples:
 - (i) Primary key
 - (ii) Super key
 - (iii) Candidate key
 - (iv) Foreign key
 - (v) Alternate key.
3. Explain the following terms with examples:
 - (i) Cardinality
 - (ii) Entity
 - (iii) Relationship
 - (iv) Participation constraint.
4. Can a weak entity set have more than one primary key for the same foreign key? Justify with example.
5. "All candidate keys can be primary keys". Do you agree with the statement? Justify your answer.
6. Explain the following terms:
 - (i) Aggregation
 - (ii) Generalization
 - (iii) Super key
 - (iv) Candidate keys.
7. What is a weak-entity set? Explain with example.
8. Explain the distinction among the terms—primary key, candidate key and the super key.
9. Discuss in detail the various constructs used in ER-diagram, giving suitable example.
10. What do you understand by the term ER diagram? Sketch the ER diagram of Railway reservation system and then reduce this diagram into tables.
11. Explain the following terms briefly:
 - (i) Attribute
 - (ii) Domain
 - (iii) Entity
 - (iv) Relationship
 - (v) Entity set
 - (vi) One to many relationship
 - (vii) Participation constraint
 - (viii) Weak entity set
 - (ix) Aggregation
 - (x) Composite key.
12. What is entity, entity type, entity sets and attribute? What is mapping cardinalities? Explain different cardinalities.
13. Discuss the role of ER diagrams in the design of relational database. Illustrate your answer with the help of an example.

14. Define the term ER diagram. Explain the various types of relationships in a ER diagram. Draw an ER diagram for taking your own example.
15. What is an ER diagram? Give an ER diagram for a database showing fatherhood, motherhood and spouse relationship among men and women.
16. Design the ER diagram for the Educational Institute System. Make you own assumptions about the system.
17. Differentiate between the following with examples:
 - (a) Entity and attributes
 - (b) Primary and foreign key
 - (c) Candidate key and primary key.
18. In an organization several projects are undertaken. Each project can employ one or more employees. Each employee can work on one or more projects. Each project is undertaken on the request of a client. A client can request for several projects. Each project has only one client. A project can use a number of items and an item may be used by several projects. Draw an ER diagram and convert it into a relational schema.
19. A bank has many branches, with many customers. A customer can open many different kinds of accounts with the bank. Any customer of the bank can take loan from the bank. All branches can give loans. Banks have also installed automatic teller machines, from which a customer can withdraw from his/her bank. Draw the ER-diagram for the bank specifying aggregation, generalization or specialization hierarchy, if any. Create 3NF tables of your design. Make suitable assumptions if any.
20. Make an ER diagram for a diagnostic lab. It should keep track of customers, raw material, professional and support staff, and the reports being generated for tests. Make and state assumptions, if any.
21. A University has many academic units named schools. Each school is headed by a director of school. The school has teaching and non-teaching staff. A school offers many courses. A course consists of many subjects. A subject is taught to the students who have registered for that subject in a class by a teacher. Draw the ER diagram for the University specifying aggregation, generalization or specialization hierarchy, if any. Create 3NF tables of your design. Make suitable assumptions, if any.
22. A national bank and an international bank decide to merge. Assume, that both the organizations use almost similar ER diagrams. Prepare the ER diagram for the merged bank. Make, and state, suitable assumptions if any.
23. A construction company has many branches spread all over the country. The company has two types of constructions to offer : Housing and Commercial. The housing company provides low income housing, medium style housing and high end housing schemes, while on the commercial side it offers multiplexes and shopping zones. The customers of the company may be individuals or corporate clients. Draw the ER diagram for the company showing generalization or specialization hierarchies and aggregations, if any. Also create 3NF tables of your design.