

DBMS Assignment - Unit 3 (Solved & Formatted)

Source: User's uploaded file (Assignment Unit 3).

Fill in the Blanks (Answers)

1. The network model is based on a **graph** structure that allows many-to-many relationships.
2. The hierarchical model supports **one-to-many** relationships, where each parent can have multiple children.
3. A **primary** key in a table uniquely identifies each row in that table.
4. The concept of **inheritance** allows an object to inherit properties and behavior from another object.
5. A **composite** attribute can be divided into smaller sub-parts.
6. A **derived** attribute is calculated from other attributes.
7. **Cardinality** specifies the number of instances of one entity that can or must be associated with each instance of another entity.
8. **Total** participation means that all instances of an entity must participate in the relationship.
9. A weak entity set can be identified uniquely only by considering the primary key of the **owner (or identifying)** entity.
10. **Aggregation** is a bottom-up approach in which lower-level entities are combined to form a higher-level entity.

Short Answer / Long Answer Solutions

1. Define the following concepts: Entity, Attribute, Relationship

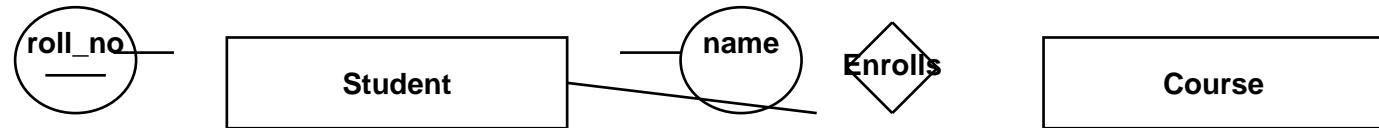
Answer:

Entity: An entity is a real-world object or concept that can be distinctly identified. Examples: Student, Book, Employee. Attribute: An attribute is a property or characteristic of an entity. Attributes describe entities. Examples: Student(name, roll_no, DOB). Attributes can be simple, composite, multi-valued, or derived. Relationship: A relationship describes how two or more entities are associated with one another. Examples: 'Enrolls' between Student and Course, 'Works_In' between Employee and Department.

2. Explain: E-R Diagram with its Symbols

E-R Diagram (Entity-Relationship Diagram) is a graphical representation of entities, their attributes, and relationships. Common symbols: - Entity: Rectangle (e.g., Student) - Attribute: Ellipse (e.g., name, age). Underline indicates a primary key attribute. - Relationship: Diamond (e.g., Enrolls) - Multi-valued attribute: Double ellipse (e.g., phone_numbers) - Weak entity: Double rectangle - Composite attribute: An attribute connected to sub-attributes (e.g., Address -> Street, City, Pin) - Derived attribute: Dashed ellipse An E-R diagram helps in conceptual database design by visually modelling data requirements.

Example E-R Diagram: Student --- Enrolls --- Course



3. Explain: Mapping Cardinalities with its Types in detail

Mapping cardinality specifies how many instances of an entity relate to one instance of another entity. Common types:

- 1. One-to-One (1:1): A single instance of A relates to a single instance of B. Example: Country - Capital.
- 2. One-to-Many (1:N): A single instance of A can relate to multiple instances of B. Example: Department - Employees.
- 3. Many-to-One (N:1): Many instances of A relate to a single instance of B (reverse of 1:N).
- 4. Many-to-Many (M:N): Multiple instances of A relate to multiple instances of B. Example: Students - Courses (Enrollments). In relational schemas, many-to-many relationships are usually implemented with a separate junction/associative table.

4. Explain: Participation Constraints with its Types

Participation constraints describe whether all or only some entity instances participate in a relationship.

- 1. Total (or Mandatory) Participation: Every instance of the entity must participate in the relationship. Visually shown by a double line between the entity and the relationship.
- 2. Partial (or Optional) Participation: Some instances may not participate. Shown by a single line.

Examples:

- If every Employee must be assigned to a Department, Employee's participation in Works_In is total.
- If some Students may not enroll in any Course at a term, Student's participation in Enrolls is partial.

5. Explain: Weak Entity Set with Example

A weak entity set is an entity that cannot be uniquely identified by its own attributes alone and depends on an 'owner' or 'identifying' entity. It typically has a partial key and uses a total participation in the identifying relationship. Weak entities are shown with a double rectangle and the identifying relationship with a double diamond. Example: Consider 'Dependent' as a weak entity for 'Employee'. A dependent (like a child) may not have a unique ID across the company but can be uniquely identified by (employee_id, dependent_name). Employee (owner) --- Identifies --- Dependent (weak).



6. Difference between: Generalization and Specialization

Generalization and Specialization are inverse concepts used in ER modelling:

- Generalization: Bottom-up approach: Combine lower-level (sub) entities into a higher-level (super) entity.
- Focus: Identify common attributes and relationships among sub-entities.
- Example: Cat and Dog generalized into Animal.
- Specialization: Top-down approach: Divide a higher-level entity into lower-level sub-entities.
- Focus: Create sub-entities with specific attributes or relationships.
- Example: Employee specialized into Manager and Engineer.

Key differences: Generalization abstracts commonalities; Specialization creates detailed subtypes. Both can be disjoint or overlapping and may use total/partial participation constraints.

7. Explain generalization and specialization in ER diagram with suitable example

Example (Specialization): Consider an entity 'Vehicle' with attributes (vehicle_id, make, model). Specialization can produce sub-entities 'Car' (with attribute num_doors) and 'Truck' (with attribute cargo_capacity). This is shown in ER diagrams by drawing the super-entity and connecting sub-entities with an ISA relationship (triangle or line with discriminator). Example (Generalization): Given entities 'Undergrad' and 'Postgrad', generalize them into 'Student' which holds common attributes (student_id, name), while specific attributes remain in sub-entities.