Part 1: Multiple Choice (45 points - 3 points per question)

(A) 1. Which is an entity in a hospital?
   (A) Equipments (B) Name (C) Address (D) All of the above

(D) 2. Which is true?
   (A) Database system is a collection of related data. (B) Meta-data is the state of data.
   (C) Database schema changes every time the database is updated. (D) None of the above

(C) 3. Which is not a database modification operation? (A) Deletion (B) Insertion (C) Query (D) Update

(D) 4. Which is not a characteristic of the database approach?
   (A) Sharing of data (B) Reducing data redundancy (C) Data independence (D) Data security

(C) 5. Who is responsible to controlling the database use and monitoring efficiency of operations?
   (A) Application programmer (B) Database designers (C) Database administrators (D) None of the above

(B) 6. Which is false?
   (A) A valid state is a state that satisfies the structure and constraints of the database.
   (B) Database schema refers to the content of a database at a moment
   (C) Schema is also called intension.
   (D) The database state changes very frequently.

(A) 7. ER model is a type of ________ data models.
   (A) conceptual (B) physical (C) implementation (D) hierarchical

(D) 8. A ________ is a rule that cannot be violated by database users.
   (A) construct (B) attribute (C) schema (D) None of the above

(A) 9. Which is used to specify the conceptual schema of a database?
   (A) DDL (B) DML (C) DQL (D) None of the above

(B) 10. Which is false?
   (A) An relationship can relate two or more entities.
   (B) A weak entity inherits the attributes from the identifying entity.
   (C) Cardinality ratio specifies maximum participation.
   (D) A relationship can have one or more attributes.

(B) 11. Which is in the DBMS-dependent design process?
   (A) Requirement analysis (B) Transaction implementation (C) Conceptual design (D) None of the above

(C) 12. The ________ of a relationship type is the number of participating entity types.
   (A) cardinality (B) identification (C) degree (D) participation

(D) 13. Which is true?
   (A) A relationship set is the schema description of a relationship.
   (B) The relationship instance is the current state of a relationship type.
   (C) A relationship cannot relate two entities of the same type.
   (D) None of the above

(C) 14. An attribute that uniquely identifies an entity is called a(n) ________ attribute.
   (A) weak (B) identifying (C) key (D) relationship

(B) 15. An order can have a number of parts. Parts can be provided by different vendors. The relationship
   of orders to vendors is a ________ relationship.
   (A) one-to-many (B) many-to-many (C) many-to-one (D) one-to-one

Part 2: Questions and Answers (58 points)

1. (20 points) Briefly explain these terminologies. If they are acronyms, also write what they stand for.
   (a) DML (b) ODBC (c) XML (d) Data Independence (e) Weak entity
      (a) Data Manipulation Language (DML) is a language used to specify database retrievals and updates.
(b) Object/Open Database Connectivity (ODBC) is an application Program Interface (API) to access server databases promoted by Microsoft.

c) EXtensible Markup Language (XML) is a language used to specify the data content.

d) Data independence is the capacity to change the lower-level schema without having to change the higher-level schema.

e) A weak entity is an entity type whose existence depends on another entity.

2. (a) (4 points) What is data model?
(b) (6 points) Describe the three-schema architecture.

(a) A set of concepts to describe the structure of a database, the operations for manipulating these structures, and certain constraints that the database should obey.

(b) • **Internal schema** at the internal level to describe physical storage structures and access paths (e.g. indexes).
  • **Conceptual schema** at the conceptual level to describe the structure and constraints for the whole database for a community of users.
  • **External schemas** at the external level to describe the various user views.

3. (a) (4 points) Illustrate the three-tier client-server architecture.
(b) (6 points) Explain the functions for each tier in the three-tier architecture.

(a) • The first tier has the Web browser, which provides the user interface.
(b) • The middle tier has Web server and the applications that require database access.
• The third tier has the database system and the database itself.

4. (10 points)

(a) (5 points) Explain the differences among an entity, an entity type, and an entity set.
(b) (5 points) Describe the two alternatives for specifying structural constraints on relationship types.

(a) • An entity is a specific object or thing in the mini-world that are represented in the database.
• An entity type is a collection of entities that share common properties or characteristics.
• An entity set is the collection of entities in the database.

(b) • Entity-to-Entity constraint:
  – Cardinality ratios - 1:1, 1:N, N:1, or M:N for binary relationships
  – Participation constraints - total or partial
• Entity-to-Relationship constraint specifies minimum and maximum numbers (min, max) on the participation of each entity type in a relationship type.

5. (8 points) Please draw the ER diagram for a hospital which can store the information of doctor, register, and patients. Each of entity in the ER diagram should have at least 3 attributes.