Part 1: Multiple Choice (78 points - 3 points per question)

(B) 1. Which is an entity in an amusement park? (A) location (B) attraction (C) revenue (D) none of the above

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

(A) 3. Which is not a DBMS functionality?
   (A) Transforming data format (B) Instantiating a database
   (C) Sharing by a set of concurrent users (D) Presentation and visualization of data

(D) 4. Which is not a main characteristic of the database approach?
   (A) Data abstraction (B) Support of multiple views of the data (C) Data sharing (D) Data analysis

(B) 5. Who is responsible to define the content of a database?
   (A) Application programmer (B) Database designer (C) Database administrator (D) None of the above

(D) 6. Which is not an advantage of using the database approach?
   (A) Controlling redundancy (B) Restricting unauthorized access to data
   (C) Providing Storage Structures (D) Reducing integrity constraints

(C) 7. Which is true?
   (A) ER is a physical data model. (B) Database state is the description of a database.
   (C) Database schema is called intension. (D) none of the above

(B) 8. Which schema is used to describe the structure and constraints for the whole database?
   (A) Internal (B) Conceptual (C) External (D) None of the above

(D) 9. _____ specify some restrictions on valid data. (A) constructs (B) validity (C) cardinality ratio (D) none of the above

(B) 10. Which is a DBMS? (A) Apache (B) Microsoft Access (C) Microsoft Visio (D) none of the above

(C) 11. Which is usually to represent a relationship in an ER diagram? (A) adjective (B) noun (C) verb (D) proposition

(A) 12. Which is in the DBMS-independent design process?
   (A) Functional analysis (B) Transaction implementation (C) Application program design (D) None of the above

(C) 13. The _____ of a relationship type is the number of participating entity types.
   (A) cardinality (B) identification (C) degree (D) participation

(D) 14. An attribute that can be broken down into smaller parts is called a(n) _____ attribute.
   (A) simple (B) associative (C) derived (D) composite

(D) 15. Which is true?
   (A) A relationship set is the schema description of a relationship. (B) A relationship can have only one attribute.
   (C) The relationship instance is the current state of a relationship type. (D) None of the above

(C) 16. An attribute that uniquely identifies an entity is called a(n) _____ attribute.
   (A) weak (B) identifying (C) key (D) relationship

(B) 17. Which type of relationships between an Ebay auction item and the bid?
   (A) one-to-one (B) one-to-many (C) many-to-one (D) many-to-many

(B) 18. Which is the process to group several classes with common features into a superclass?
   (A) Specialization (B) Generalization (C) Aggregation (D) Identification

(D) 19. Which is represented by a double dashed ellipse in a ER diagram?
   (A) weak entity (B) composite attribute (C) derived attribute (D) none of the above

(C) 20. The relational model is a type of ____ data models. (A) conceptual (B) physical (C) implementation (D) hierarchical

(D) 21. In the following EER diagram, which is true?

   (A) A student must be a graduate student, an undergraduate, or a special student.
   (B) A student must be a graduate student or an undergraduate student.
   (C) A student must be at least a special student.
   (D) None of the above
22. An entity whose existence depends on another entity is called:
(A) codependent entity (B) variant entity (C) strong entity (D) weak entity

23. An attribute of the superclass that determines the subclass(es) is called the:
(A) determinant (B) discriminator (C) indicator (D) identification

24. In the following EER diagram, which is true?

(A) An owner must be a bank, a person, and a company.
(B) An owner is the union of a bank, a person, and a company.
(C) An owner need not be either one of a bank, a person, and a company.
(D) None of the above

25. Which of the following is true?
(A) E. F. Codd first proposed the relation model.
(B) In a superclass/subclass hierarchy, each subclass has only one superclass.
(C) Data warehouse is a centralized storehouse of metadata.
(D) None of the above

26. Which database language is used to specify database retrievals and updates?
(A) DDL (B) DML (C) DCL (D) none of the above

Part 2: Questions and Answers (84 points)

1. (20 points) Briefly explain these terminologies. If they are acronyms, also write what they stand for.
   (a) XML (b) persistent object (c) JDBC (d) UML (e) ontology

2. (a) eXtensible Markup Language (XML) is a language for defining markup languages.
(b) Persistent object is a data item which exist after the application is terminated.
(c) Java Database Connectivity (JDBC) is a application Program Interface (API) to access server databases for Java.
(d) Unified Modeling Language (UML) is an object modeling and specification language used in software engineering.
(e) Ontology is a conceptual modeling to represent a specification of a knowledge structure.
   or
   Ontology means using conceptual modeling and other tools to develop "a specification of a conceptualization".

3. (a) (4 points) What is data model?
   (b) (3 points) What is mapping?
   (c) (3 points) What is a relational database?

   (a) A data model is 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) Data models are needed to capture the nature of and relationships among data. Data models are fundamental for effectiveness and efficiency of a database.
   (c) A relational database is a database that represents data as a collection of tables in which all data relationships are represented by common values in related tables.

4. (a) (4 points) Illustrate the three-tier client-server architecture.
   (b) (3 points) Explain the functions for each tier in the three-tier architecture.
   (c) (3 points) Give an example of a software for each tier respectively.

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

(c) Client: firefox, Web server: Apache, Database server: MySQL.

5. (10 points)
(a) (5 points) Explain the differences among a relationship instance, a relationship type, and a relationship set.
(b) (5 points) Describe the two alternatives for specifying structural constraints on relationship types.

(a) • A relationship instance is an instance that relates individual participating entities.
• A relationship type is the schema description of a relationship.
  or
• A relationship type is the collection of all relationship instances that have same participating entity types.
• A relationship set is the current set of relationship instances represented 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.

6. (12 points) Briefly explain the four constraints on specialization and generalization and give an example for each case.

• The disjointness constraint specifies that the subclasses of the specialization must be disjoint.
  A graduate student cannot be a undergraduate at the same time.
• The overlapping specialization specifies that the subclasses of the specialization can be overlapping.
  A manager can be an engineer at the same time.
• The total specialization specifies that every entity in the superclass must be a member of some subclass.
  Human beings can be classified into males and females.
• The partial specialization specifies that an entity in the superclass is allowed not to belong to any of the subclasses.
  A student need not to be an undergraduate or a graduate student.

7. (10 points) Draw a ER diagram to illustrate a security personnel who patrols each room and keep the patrol record.

8. (12 points) Consider a Hollywood Enterprise that requires modeling information about the different type of people involved in the movie production.

• Each person should have person ID, name, phone, gender, and address.
• There are two main groups of persons: Movie professionals and celebrity. Each movie professionals work on some company.
- A movie professionals can be either a director or an agent. Each director has her or his popularity and can direct a number of movies. Each agent has the agent fee.
- A celebrity can be a movie star, a model, or both. Each movie star has her or his movie style and play in some movies. Each model has her or his preferences.
- Each movie has the information about the title, released date, and language.

Draw a EER diagram for the above HollyWood Enterprise.