Database Design Midterm Exam

Student No: ___________________________ Name: ___________________________

Part 1: Multiple Choice (75 points - 3 points per question)

(B) 1. Which is true?
   (A) Metadata is the state of data. (B) XML is a type of semi-structured data.
   (C) Database schema changes every time the database is updated. (D) None of the above

(C) 2. Which is the biggest problem with data redundancy?
   (A) Data dependence (B) Limited data sharing (C) Data inconsistencies (D) None of the above

(C) 3. Which of the following is not a cost of the database approach?
   (A) Specialized personnel (B) Organizational conflict (C) Improved responsiveness (D) Cost of conversion

(D) 4. Which is an application of data warehouses?
   (A) File updating (B) Shipping of information. (C) Order processing (D) None of the above

(A) 5. Which is a rule that cannot be violated by database users?
   (A) constraint. (B) program. (C) password. (D) view.

(B) 6. Which is a DBMS? (A) Apache (B) MySQL (C) PHP (D) Microsoft Excel

(B) 7. Which is an entity in a museum? (A) Open hours (B) Exhibition items (C) Ticket price (D) None of the above

(A) 8. Which is the description of a database?
   (A) Database schema (B) Schema diagram (C) Schema construct (D) Database state

(C) 9. Which is usually to represent a relationship in an ER diagram? (A) adjective (B) noun (C) verb (D) proposition

(A) 10. Which is the SDLC phase in which the functional system specifications is created?
   (A) analysis (B) design (C) implementation (D) planning

(D) 11. Transforming the data specifications into basic, or atomic elements following well-established rules is called:
   (A) design. (B) implementation. (C) typing and cross-matching. (D) normalization.

(B) 12. 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

(D) 13. An attribute that can be broken down into smaller parts is called a(n) _____ attribute.
   (A) simple (B) associative (C) derived (D) composite

(C) 14. An entity whose existence depends on another entity is called:
   (A) codependent entity (B) variant entity (C) weak entity (D) strong entity

(D) 15. Which is an attribute that uniquely identifies an entity?
   (A) weak (B) relationship (C) identifying (D) identifier/key

(B) 16. A relationship between the instances of three entity types is called a(n): (A) binary relationship (B) ternary relationship (C) unary relationship (D) primary relationship

(A) 17. In the following figure, which attribute is derived? (A) Years_Employed (B) Address (C) Skill (D) Employee_ID

(A) 18. Which of the following is true?
   C (A) The EER is a type of conceptual data models.
   (B) A business rule specification should be written strictly in computer code.
   (C) UML is used for conceptual data modeling.
   (D) None of the above

(A) 19. Which is the process of defining a set of subclasses of a superclass?
   (A) Specialization (B) Generalization (C) Aggregation (D) Identification

(D) 20. Which is false?
   (A) The supertype/subtype relationships are also called IS-A relationships.
   (B) An entity cannot exist in the database merely by being a member of a subtype.
   (C) A member of the supertype can be optionally included as a member of any number of its subtypes.
   (D) It is necessary that every entity in a supertype be a member of some subtypes.

(D) 21. An attribute of the supertype that determines the target subtype(s) is called the:
   (A) subtype determinant (B) disjoint indicator (C) subtype identification (D) subtype discriminator
(A) 22. The property by which subtype entities possess all attributes of a supertype is called attribute:  
   (A) inheritance (B) generalization (C) aggregation (D) identification 

(C) 23. In the SQL language, which statement can be used to implement business rules in databases?  
   (A) Create rule (B) Create operation (C) Create assertion (D) None of the above 

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

(A) A student must be a graduate student or an undergraduate student. 
(B) A student must be a graduate student, an undergraduate, or a special student. 
(C) A student must be at least a special student. 
(D) None of the above 

(B) 25. Which of the following is true?  
   (A) C. J. Date first proposed the relation model. 
   (B) In a supertype/subtype hierarchy, each subtype has only one supertype. 
   (C) Data warehouse is a centralized storehouse of metadata. 
   (D) None of the above 

Part 2: Questions and Answers (87 points) 

1. (28 points) Briefly explain these terminologies. If they are acronyms, also write what they stand for. 
   (a) data independence  (b) XML  (c) DBMS  (d) SDLC  (e) identifying relationship  (f) ERP  (g) data mining 
   (a) Data independence is the capacity to change the lower-level schema without having to change the higher level schema. 
   (b) XML (eXtensible Markup Language) is a language for defining markup languages. 
   (c) Database management system (DBMS) is software used to create, maintain, and provide controlled access to databases. 
   (d) System Development Life Cycle (SDLC) is a systematic approach to the software development. 
   (e) An identifying relationship is the relationship between a weak entity type and its owner. 
   (f) Enterprise resource planning (ERP) is an information technology term referring to an integrated system that serves all departments within an enterprise. 
   (g) The data mining can be defined in either one as shown in below:  
      i. The discovery of new information in terms of patterns or rules from vast amounts of data. 
      ii. The process of finding interesting structure in data. 
      iii. The process of employing one or more computer learning techniques to automatically analyze and extract knowledge from data. 

2. (a) (4 points) What is data model?  
   (b) (3 points) Name the three-schema architecture.  
   (c) (2 points) Why do we need mappings between schema levels?  
   (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) In the three-schema architecture, schemas can be defined at three levels: internal schema, conceptual schema, and external schemas. 
   (c) We need mappings to achieve data independence. 

3. (a) (4 points) Explain the differences between a relationship instance and a relationship type.  
   (b) (3 points) What is the degree of relationships?  
   (c) (3 points) What is the cardinality of relationships?
(a) A relationship instance is an instance that relates individual participating entities. A relationship type is the collection of all relationship instances that have same participating entity types.

(b) The degree is the number of entity types that participate in a relationship.

(c) The Cardinality specifies the number of instances of one entity that can be associated with each instance of another entity.

4. (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.

5. (a) (4 points) Illustrate the three-tier client-server architecture.

(b) (6 points) Explain the functions for each tier in the three-tier architecture.

6. (8 points) Please draw the ER diagram for a bookstore which can store the information of books, purchase, and customers. Each of entity in the ER diagram should have at least 3 attributes.

7. (10 points) Draw the EER diagram for a non-profit organization. The non-profit organization has three types of participants: employee, volunteer, and donor. The common attributes for them are: identity number, name, address, city, province/state, zip code, and telephone number. The specific attribute for an employee is date hired. The specific attribute for a volunteer is skill. A donor donates multiple items and each item can be donated by different donors.