Part 1: Multiple Choice (102 points - 3 points per question)

(D) 1. Which is a SQL DDL command? (A) delete (B) grant (C) update (D) none of the above

(B) 2. Which SQL statement is used to extract data from a database? (A) extract (B) select (C) get (D) list

(B) 3. Which allows the database application to find data fast? (A) unique (B) index (C) distinct (D) none of above

(D) 4. Which SQL keyword is used to identify an attribute is a key in a table? (A) distinct (B) check (C) specific (D) unique

(C) 5. Which SQL command is used to empty a table? (A) delete table (B) drop table (C) truncate table (D) none of the above

(B) 6. What result set will the following query return? select ticker from stock where price < 20;
   (A) The stocks of tickers whose price is less than 20. (B) The tickers of stocks whose price is less than 20.
   (C) The prices of stocks whose tickers is less than 20. (D) none of the above

(C) 7. In the like operator of SQL, which can represent any string? (A) * (B) ; (C) % (D) _

(A) 8. Which SQL operator allows you to compare strings using wildcards? (A) like (B) as (C) in (D) none of the above

(A) 9. Which is used to to sort the result set in SQL? (A) order by (B) group by (C) sort by (D) having

(B) 10. Which of the following finds those groups meeting stated conditions?
   (A) group by (B) having (C) using by (D) none of above

(A) 11. Which is not a aggregation function in SQL? (A) round() (B) sum() (C) avg() (D) max()

(C) 12. Which is used to decide if a value is null in SQL?
   (A) value equal null (B) value == null (C) value is null (D) none of the above

(C) 13. Which SQL operator is used to specify multiple values in a where clause?
   (A) belong (B) include (C) in (D) none of the above

(C) 14. With SQL, how can you retrieve records of Zony and Yony from a table named kids?
   (A) select * from kids where name like '%ony' (B) select * from name where kids = 'Zony' or kids = 'Yony'
   (C) select * from kids where name = 'Zony' or name = 'Yony' (D) none of the above

(D) 15. Which integrity constraints can trigger a sequence of operations? (A) restrict (B) set default (C) set null (D) cascade

(C) 16. Which SQL statement is used to return only different values? (A) unique (B) index (C) distinct (D) none of the above

(C) 17. Which is used to create a virtual table in SQL?
   (A) create virtual (B) create relation (C) create view (D) none of the above

(B) 18. Which is a join condition in the following SQL commands?
   select name from employee, department
   where department_name = 'Research' and employee.department_no = department.department_no;
   (A) department_name = 'Research' (B) employee.department_no = department.department_no
   (C) select name from employee, department (D) none of above

(C) 19. The UNION clause is used to:
   (A) join two tables together to form one table. (B) find all rows that do not match in two tables. (C) combine the output from multiple queries into a single result table. (D) none of above.

(D) 20. In MySQL which command can show the schema of a table? (A) show (B) display (C) present (D) describe

(C) 21. In MySQL which is used to execute a SQL script? (A) use (B) \e (C) \ (D) none of above

(C) 22. When you log into your Facebook account, which SQL command will be used?
   (A) alter (B) delete (C) select (D) drop table

(B) 23. Which is an entity in a hospital? (A) address (B) nurse (C) website (D) none of the above

(A) 24. Which is usually to represent a relationship in an ER diagram? (A) verb (B) noun (C) adjective (D) proposition

(D) 25 An entity whose existence depends on another entity is called:
   (A) codependent entity (B) variant entity (C) strong entity (D) weak entity

(A) 26. The _____ of a relationship type is the number of participating entity instances.
   (A) cardinality (B) degree (C) identification (D) participation

(D) 27. Which is true?
   (A) A relationship type is the current state of a relationship. (B) A relationship cannot have more than one attribute.
   (C) A relationship instance identifies certain relationship constraints. (D) none of above

(A) 28. Which type of relationships between an auction item and a bid?
   (A) one-to-many (B) many-to-many (C) many-to-one (D) one-to-one

(D) 29. In the following EER diagram, which is true?
   (A) A student must be a graduate or an undergraduate student.
   (B) A student must be at least a special student.
   (C) A student must be a graduate student, an undergraduate, or a special student.
   (D) none of the above
Part 2: Questions and Answers (108 points)

1. (28 points) Briefly explain these terminologies. If they are acronyms, also write what they stand for.
   (a) UML (b) trigger (c) assertion (d) EER model (e) identifying relationship (f) ontology (g) semantic Web
      (a) Unified Modeling Language (UML) is a standard language for modeling software systems.
      (b) A trigger is a statement that is automatically executed in response to certain events on a particular table or view in a database.
      (c) An assertion is any condition that the database must always satisfy.
      (d) Enhanced Entity-Relationship (EER) model is a high-level conceptual data model enhanced with superclasses and subclasses to represent an object as an entity and associate these entities using relationships.
      (e) An identifying relationship is a relationship that links a strong entity to a weak entity.
      (f) Ontology is a knowledge structure that describes the concepts of the domain and how these concepts are interrelated.
      (g) Semantic Web is a framework that includes semantic content in Web pages allowing meaningful information exchange and search among machines.

2. (a) (4 points) What does SQL stand for? Explain it.
    (b) (6 points) Based on the functions how can SQL be classified into three categories?
    (a) Structured Query Language (SQL) is a standard language used to retrieve, update and delete data from relational database management systems (DBMS).
    (b) Data Definition Language (DDL) is used to define databases.
    Data Manipulation Language (DML) is used to manipulate databases.
    Data Control Language (DCL) is used to control databases.

3. (12 points) Briefly explain the four constraints on specialization and generalization.
   - The disjointness constraint specifies that the subclasses of the specialization must be disjoint.
   - The overlapping specialization specifies that the subclasses of the specialization can be overlapping.
   - The total specialization specifies that every entity in the superclass must be a member of some subclass.
   - The partial specialization specifies that an entity in the superclass is allowed not to belong to any of the subclasses.

4. (30 points) Consider the following three tables for a library:
   borrower(card_no, name, phone_no) book_loan(card_no, book_id, date_out, duration) book(book_id, title)
   where primary keys are underlined. card_no and book_id in the book_loan table are foreign keys referencing to the borrower and book table respectively.
   Use SQL to answer the following questions.
   (a) (4 points) Create the borrower table.
   (b) (2 points) Insert a borrower whose card ID is 'B101168', whose name is 'Justin Timberlake', and whose phone number is '03-5186417' into the borrower table.
   (c) (2 points) Change 'Database' to 'Database System' in the book table.
   (d) (2 points) Add a attribute publisher into the book table.
   (e) (3 points) Specify a constraint duration <= 90 in the book_loan table.
   (f) (3 points) Specify the primary key (card_id, book_id) in the book_loan table.
   (g) (3 points) Count the number of different books currently borrowed by all borrowers between April 16 and May 15, 2014.
   (h) (3 points) List the titles of books that are borrowed on May 15, 2014.
   (i) (4 points) Remove all books borrowed by 'Lady Gaga' from the book table.
   (j) (4 points) Count the number of books borrowed by each borrower.
(a) create table borrower (  
card_no char(6) primary key not null,  
name varchar(30),  
birthdate date)
(b) insert into borrower values ('B101168', 'Justin Timberlake', '03-5186417')
(c) update book set title = 'Database System' where title = 'Database'
(d) alter table book add publisher varchar(30);
(e) alter table book_loan add constraint duration_constraint check (duration <= 90)
(f) alter table book_loan add primary key (card_id, book_id)
(g) count (distinct book_id) from book_loan where date_out = '204-04-16' and date_out = '204-05-15'
(i) delete from book where book_id in (select book_id from borrower, book_loan where borrower.card_no = book_loan.card_no  
and name = 'Lady Gaga')
(j) select borrower_id, name, count(*) from borrower, book_loan where borrower.card_no = book_loan.card_no group by  
card_no
or
select count(*) from book_loan group by card_no

5. (16 points) Consider the following relations for a database that keeps track of student enrollment in courses:

   student (student_no, name, major, email)
   enroll (student_no, course_no, semester, time, classroom)
   course (course_no, course_title, credit)

   (a) (8 points) Please draw the ER diagram and indicate the key attributes.
   (b) (8 points) Please draw the relational schema diagram and indicate the primary keys and the referential constraints.

   (a)

   (b) student:  
   enroll:  
   course:  

6. (12 points) Draw an EER diagram for students described as below:
   • A student has the student number, the name, the birth date, and the class.
   • Students can be classified into elementary school, junior high school, senior high school, and college students.
   • A senior high school student has a category indicating a traditional or vocational student.
   • A college student has a major.
   • College students can be classified into undergraduate and graduate students.
   • Each graduate student is supervised by an advisor.
   • An advisor has the name and the rank.