



# The University of Fiji

SCHOOL OF SCIENCE AND TECHNOLOGY

DEPARTMENT OF COMPUTER SCIENCE / INFORMATION TECHNOLOGY

FINAL EXAMINATION SEMESTER 2, 2015

DATABASE SYSTEMS

ITC104

Time Allowed: Three hours (3 hours)

(An extra ten minutes is allowed for reading this paper)

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## INSTRUCTIONS

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- 1.0 Write all your answers in the **Answer Book** provided.
- 2.0 There are eight (8) pages of questions in this Question Booklet (excluding the Cover Page).
- 3.0 Write your **Student Identification Number** on the front page of the **Answer Book**.
- 4.0 If you use extra sheets of paper, be sure to show clearly the question number(s) being answered and to tie each sheet securely in your Answer Book at the appropriate place.
- 5.0 There are **two** sections in this paper; **Section A** consists of 20 multiple choice and is worth 20 marks, **Section B** consists of 22 open ended questions and is worth 80 marks. **Answer all Questions.**
- 6.0 **Programmable calculators** are not allowed.

**SECTION A****MULTIPLE CHOICE****20 MARKS**

Circle the letter which best represents the most appropriate answer on answer grid provided.

1. The correct data type for the BALANCE column in the CUSTOMER table is \_\_\_\_\_.
  - a. char
  - b. int
  - c. smallint
  - d. decimal
2. "Should the existing system be replaced?" is a question that is asked during the \_\_\_\_ stage of the SDLC.
  - a. planning
  - b. analysis
  - c. implementation
  - d. maintenance
3. The first step in developing the conceptual model using ER diagrams is \_\_\_\_\_.
  - a. normalize the entities
  - b. complete the initial ER diagram
  - c. identify, analyze, and refine the business rules
  - d. define the attributes, primary keys, and foreign keys for each of the entities
4. In sophisticated application development software, nulls can create problems when using functions such as \_\_\_\_\_.
  - a. Count
  - b. Sum
  - c. Count and Average
  - d. Count, Sum and Average
5. \_\_\_\_\_ is a valid name for a table?
  - a. TBL\_1
  - b. 2\_TBL
  - c. TBL 3
  - d. 4 tbl
6. When you issue the DELETE FROM tablename command without specifying a where condition \_\_\_\_\_.
  - a. no rows will be deleted
  - b. the first row will be deleted
  - c. the last row will be deleted
  - d. all rows will be deleted
7. The referential integrity rule requires that \_\_\_\_\_.
  - a. every null foreign key value must reference an existing primary key value
  - b. an attribute have a corresponding value
  - c. every non-null foreign key value reference an existing primary key value
  - d. you delete a row in one table whose primary key does not have a matching foreign key value in another table

8. There is a commonly accepted shorthand representation to show the structure of a relational database: After the name of the table, all the columns in the table are listed within a set of \_\_\_\_.
- a. square brackets
  - b. parentheses
  - c. back slashes
  - d. curly braces
9. A \_\_\_\_ relationship exists when an association is maintained within a single entity.
- a. unary
  - b. ternary
  - c. binary
  - d. weak
10. A table can be deleted from the database by using the \_\_\_\_ command.
- a. drop
  - b. modify
  - c. delete
  - d. erase
11. A table that has all key attributes defined, has no repeating groups, and all its attributes are dependent on the primary key, is said to be in \_\_\_\_.
- a. 1NF
  - b. 2NF
  - c. 3NF
  - d. 4NF
12. \_\_\_\_\_ is NOT a periodic maintenance activity performed by a database administrator?
- a. Daily system-usage summary
  - b. Preventive maintenance (backup)
  - c. Corrective maintenance (recovery)
  - d. Periodic security audits based on the system-generated statistics
13. The \_\_\_\_ model is the end user's view of the data environment.
- a. internal
  - b. external
  - c. physical
  - d. conceptual
14. \_\_\_\_ is not a valid normal form of normalization.
- a. 1NF
  - b. BCNF
  - c. 3NF
  - d. MVNF
15. The SQL command that lets you save your work to disk is \_\_\_\_.
- a. insert
  - b. select
  - c. commit
  - d. update
16. The \_\_\_\_ function is used to find the highest value in a table column.
- a. max
  - b. total
  - c. sum
  - d. top

17. The command to join the P\_DESCRIPT and P\_PRICE fields from the PRODUCT table and the V\_NAME, V\_AREACODE, V\_PHONE and V\_CONTACT fields from the VENDOR table, where the value of V\_CODE match and the output is ordered by the Price is \_\_\_\_\_.

- a. SELECT P\_DESCRIPT, P\_PRICE, V\_NAME, V\_CONTACT, V\_AREACODE, V\_PHONE  
FROM PRODUCT, VENDOR  
WHERE PRODUCT.V\_CODE <> VENDOR.V\_CODE;  
ORDER BY P\_PRICE;
- b. SELECT P\_DESCRIPT, P\_PRICE, V\_NAME, V\_CONTACT, V\_AREACODE, V\_PHONE  
FROM PRODUCT, VENDOR  
WHERE PRODUCT.V\_CODE => VENDOR.V\_CODE;  
ORDER BY P\_PRICE;
- c. SELECT P\_DESCRIPT, P\_PRICE, V\_NAME, V\_CONTACT, V\_AREACODE, V\_PHONE  
FROM PRODUCT, VENDOR  
WHERE PRODUCT.V\_CODE <= VENDOR.V\_CODE;  
ORDER BY P\_PRICE;
- d. SELECT P\_DESCRIPT, P\_PRICE, V\_NAME, V\_CONTACT, V\_AREACODE, V\_PHONE  
FROM PRODUCT, VENDOR  
WHERE PRODUCT.V\_CODE = VENDOR.V\_CODE;  
ORDER BY P\_PRICE;

18. Assume you are using the UNION operator to combine the results from two identical tables, CUSTOMER and CUSTOMER\_2. The CUSTOMER table contains 10 rows, while the CUSTOMER\_2 table contains 7 rows. Customers Dunne and Olowski are included in the CUSTOMER table as well as in the CUSTOMER\_2 table. The number of records returned when using the UNION operator is \_\_\_\_\_.

- a. 17
- b. 10
- c. 15
- d. 7

19. \_\_\_\_\_ might be represented with a single-valued attribute.

- a. Person's phone number(s)
- b. Car's color
- c. Employee's educational background
- d. Computer's processor speed

20. SQL query modification commands make up \_\_\_\_\_.

- a. DDL
- b. DML
- c. XML
- d. HTML

**SECTION B****OPEN - ENDED QUESTION****80 MARKS**

Answer ALL the questions from this section in the answer booklet provided.

1. Explain what business rules are and what is its purpose in data modeling? (2 marks)
2. Define the steps used in translating business rules into data model components? (2 marks)
3. Why is an object said to have greater semantic content than an entity? (2 marks)
4. Thoroughly discuss logical and physical independence? (4 marks)
5. The 3 levels of backup used in database recovery management are full, differential and transaction log backup. Briefly describe what each of those three backup levels does. (1.5 marks)
6. The selection of DBMS software is critical to the information system's smooth operation. Discuss 3 important factors that may affect the purchasing decision of a DBMS software? (1.5 marks)
7. The dependency diagram shown below (Fig. 1) indicates that a patient can receive many prescriptions for one or more medicines over time. Based on the dependency diagram, create a database whose tables are in at least 2NF, showing the dependency diagram for each table. (3 marks)

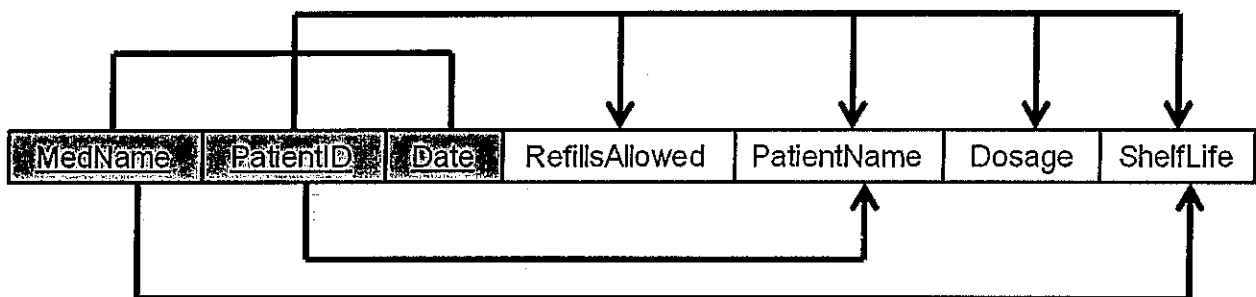


Figure 1: Dependency Diagram for Patient Prescription.

8. Define and discuss the concept of transitive dependency. (2 marks)
9. Explain when is a table in BCNF? (2 marks)

10. Use the following business rules to create a Crow's Foot ERD. Write all appropriate connectivities and cardinalities in the ERD. (10 marks)

- A department employs many employees, but each employee is employed by one department.
- Some employees, known as "rovers," are not assigned to any department.
- A division operates many departments, but each department is operated by one division.
- An employee may be assigned many projects, and a project may have many employees assigned to it.
- A project must have at least one employee assigned to it.
- One of the employees manages each department, and each department is managed by only one employee.
- One of the employees runs each division, and each division is run by only one employee.

11. What does the acronym DBLC mean and what does it portray? Thoroughly discuss its six phases. (6 marks)

12. Break up the dependency diagram (Fig. 2) to produce dependency diagrams that are in 3NF (Hint: You might have to create a few new attributes. Also, make sure that the new dependency diagrams contain attributes that meet proper design criteria; that is, make sure that there are no multivalued attributes, that the naming conventions are met, and so on.) (5 marks)

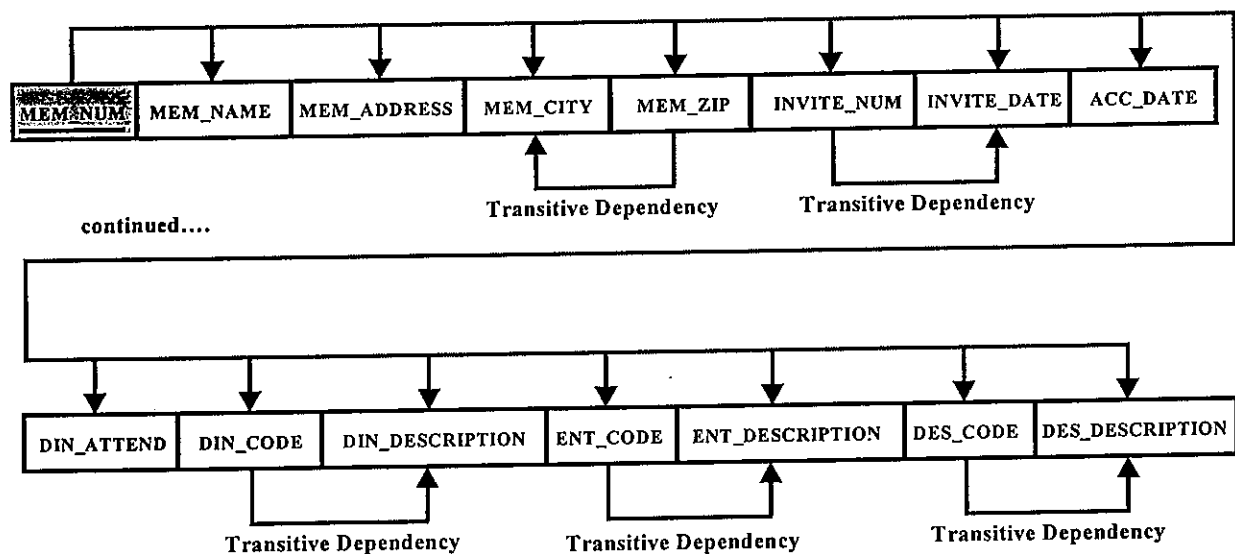


Figure 2: Dependency Diagram for Question 12

13. Compare and contrast the results of relational operator MACHINE DIFFERENCE BOOTH and BOOTH DIFFERENCE MACHINE for the 2 tables shown in Fig. 3 below. Discuss thoroughly. (2 marks)

| Table name: BOOTH |             | Table name: MACHINE |               |
|-------------------|-------------|---------------------|---------------|
| BOOTH_PRODUCT     | BOOTH_PRICE | MACHINE_PRODUCT     | MACHINE_PRICE |
| Chips             | 1.5         | Chips               | 1.25          |
| Cola              | 1.25        | Chocolate Bar       | 1             |
| Energy Drink      | 2           | Energy Drink        | 2             |

Figure 3: VendingCo database tables to answer question 13.

14. Explain why it might be more appropriate to declare an attribute that contains only digits as a character data type instead of a numeric data type. (1.5 marks)
15. What is the difference between a column constraint and a table constraint? (1.5 marks)
16. Explain why the two following commands produce different results: (2 marks)
- ```
SELECT DISTINCT COUNT (V_CODE) FROM PRODUCT;
SELECT COUNT (DISTINCT V_CODE) FROM PRODUCT;
```
17. Write the SQL code that will create the table structure for a table named EMPLOYEE with the table structure summarized in Table 1 below. (Note that the EMP\_NUM is the Primary key and EMP\_LNAME EMP\_FNAME cannot be null. (3 marks)

| ATTRIBUTE (FIELD) NAME | DATA DECLARATION |
|------------------------|------------------|
| EMP_NUM                | CHAR(3)          |
| EMP_LNAME              | VARCHAR(15)      |
| EMP_FNAME              | VARCHAR(15)      |
| EMP_HIREDATE           | DATE             |
| JOB_CODE               | CHAR(3)          |

Table 1: Summary of table EMPLOYEE

18. Having created the table structure in question 17, write the SQL code to enter the last two rows for the table shown in Table 2 below. (1 mark)

| EMP_NUM | EMP_LNAME  | EMP_FNAME | EMP_HIREDATE | JOB_CODE |
|---------|------------|-----------|--------------|----------|
| 101     | News       | John      | 08-Nov-00    | 502      |
| 102     | Senior     | David     | 12-Jul-89    | 501      |
| 103     | Arbough    | June      | 01-Dec-96    | 500      |
| 104     | Ramoras    | Anne      | 15-Nov-87    | 501      |
| 105     | Johnson    | Alice     | 01-Feb-93    | 502      |
| 106     | Smithfield | William   | 22-Jun-04    | 500      |
| 107     | Alonzo     | Maria     | 10-Oct-93    | 500      |
| 108     | Washington | Ralph     | 22-Aug-91    | 501      |
| 109     | Smith      | Larry     | 18-Jul-97    | 501      |

**Table 2: The contents of the EMPLOYEE table**

19. Assuming the data shown in the EMPLOYEE table (Table 2) have been entered, write the SQL code that will list all attributes for a job code of 500. (1.5 marks)
20. Write the SQL code to delete the row for the person named Alonzo Maria, who was hired on October 10<sup>th</sup> 1993, and whose job code classification is 500. Use logical operators to include all of the information given in this problem. (2.5 marks)
21. Change the existing data in the EMPLOYEE table in such a way that multiple rows are affected with the execution of just a single command sequence. Write the SQL code and explain how the above is possible. (4 marks)

22. TinyVideo is a small movie rental company with a single store. TinyVideo needs a database system to track the rental of movies to its members. TinyVideo can own several copies (VIDEO) of each movie (MOVIE). For example, the store may have 10 copies of the movie "Twist in the Wind". "Twist in the Wind" would be one MOVIE and each copy would be a VIDEO. A rental transaction (RENTAL) involves one or more videos being rented to a member (MEMBERSHIP). A video can be rented many times over its lifetime, therefore, there is a M:N relationship between RENTAL and VIDEO. DETAILRENTAL is the bridge table to resolve this relationship. The complete ERD is provided in Fig. 4 below.

The seven most important commands in SQL are CREATE, INSERT INTO, SELECT, UPDATE, DELETE, ALTER, and DROP. Using the TinyVideo ERD shown in Fig. 4 write full SQL syntaxes for successful execution of all the 7 commands mentioned above. Also discuss the purpose or result of each. Note: Each syntax should be legible and should stand out from the other.

(20 marks)

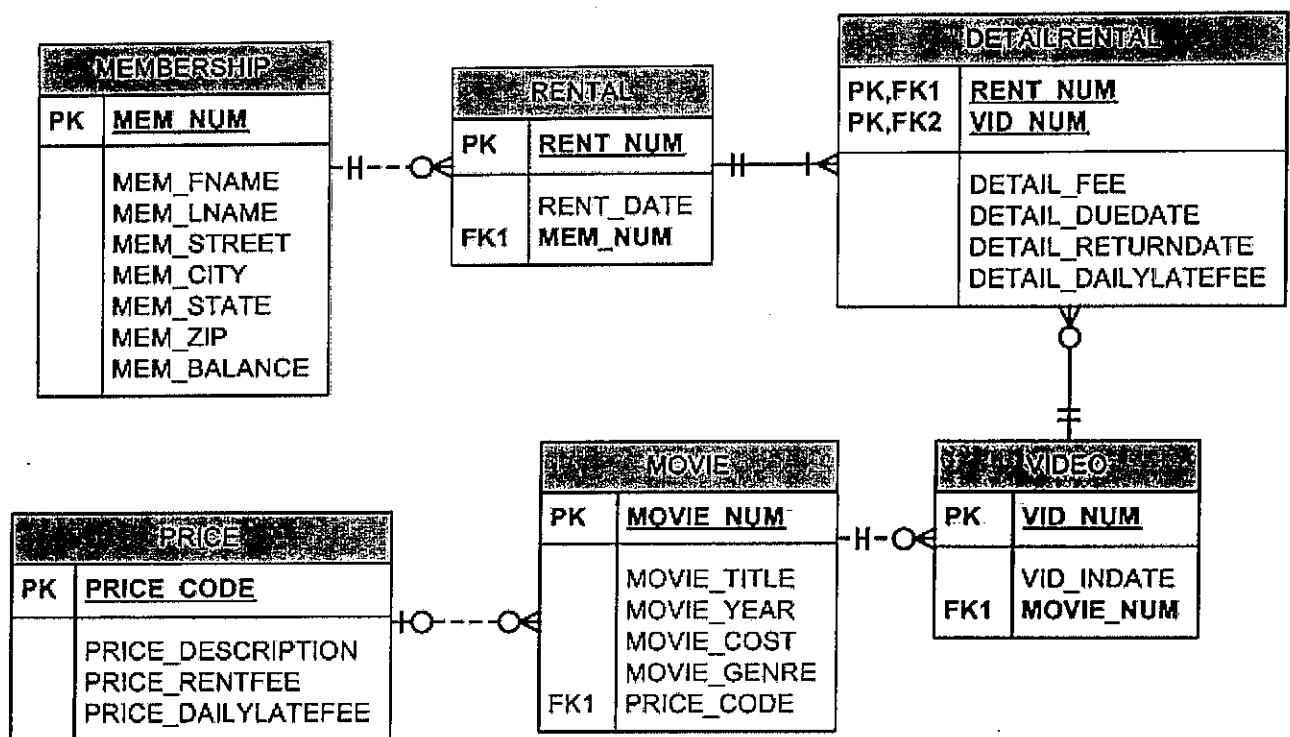


Figure 4: TinyVideo ERD

End of Exam

