COLLEGE OF ENGINEERING AND APPLIED SCIENCES

NCIS301: DATABASE SYSTEMS

END OF FIRST SEMESTER EXAMINATIONS

NOVEMBER 2023

LECTURER: MR B. MUKHALELA

DURATION: 3 HOURS

INSTRUCTIONS TO CANDIDATES

1. This paper carries **6** questions.
2. Answer **ALL** questions from **Section A (Practical using a Lab allocated computer)**.Save your work in a Zipped folder on the Desktop, folder name should be your **Student ID**.
3. Answer any **4 (four)** from **section B** questions **use Exam provided Answer booklet in the section.**
4. Each question carries **20 marks**.
5. The marks for each question are indicated in square **[]** brackets.

SECTION A

Question One

a) Consider the relational database shown in figure 2 below and use MySQL Workbench Server to implement it and enter the data into the tables as is:

The database should be named as your fullname+boats like ***mukhalelabraitonboatsdb*** **[5]**

Sailors

sid	sname	rating	age
1	Fred	7	22
2	Jim	2	39
3	Nancy	8	27

Boats

bid	bname	color
101	Nina	red
102	Pinta	blue
103	Santa Maria	red

Reserves

sid	bid	day
1	102	9/12
2	102	9/13

Figure 2: A Sample Relational Database

b) Using Reverse Engineering, design the corresponding Entity-Relationship diagram. NB: Take a screenshot from MySQL Workbench and save it **as1b reverse and forward engineering.** **[5]**

c) Implement the following queries and show the results via a print screen or screenshot.:

a. SELECT *s.sname* FROM *sailors S* WHERE *s.sname* LIKE 'F_%F'. **[2]**

b. SELECT R.sid FROM Boats B, Reserves R
WHERE R.bid=B.bid AND B.color='red'
UNION
SELECT R.sid FROM Boats B, Reserves R
WHERE R.bid=B.bid AND B.color='green' **[2]**

d) Write SQL code for creating table Reserves and show how you are to enforce referential integrity through referencing foreign keys to the other schemas. Take a screenshot of your executed code. **[3]**

e) Soon after attending to an ICT Security Policies workshop with your Senior DBA, he requested that you implement a SQL GRANT COMMAND for securing the database via a user name and a password. Now write the SQL GRANT statement for securing the database to the user 'Zvavharwa' 'Tapedza' who will be the using the Database as an Administrator. **[3]**

SECTION B

Question Two

a) Using a diagram, illustrate and explain stages of the DBLC. **[14]**

b) Identify and briefly exemplify the three types of anomalies which a Database support professional might want to avoid by normalizing database tables. **[6]**

Question Three

a) Using examples, define the following database terms:

i. Data. **[1]**

ii. Weak Entity. **[2]**

iii. Primary Key. **[2]**

iv. Referential Integrity. **[2]**

v. Cardinality. **[2]**

vi. Composite attribute **[2]**

b) Describe the three schema architecture. **[9]**

Question Four

Consider the following database tables:

Articles			
ArticleNo	**Author**	**Subject**	**Price**
56-01	Shaanewako	Database	100
25-02	Ngeekwedu	Networks	100
96-23	Charakupa	Programing	120
78-98	Mambondiani	Database	90

Journals			
JournalNo	**Author**	**Subject**	**Price**
23334	Shoko	Database	20
97862	Shaanewako	Calculus	40
10023	Ndau	Networks	30

Show the resultant table (if any) and describe the output of the following:

a) $\sigma_{\text{subject = "database" and price <="100"}}(\text{Articles})$. **[4]**

Article No	Author	Subject	Price
56-01	Shayanewako	Database	100

b) $\prod_{\text{author}}$ (Articles) ∪ $\prod_{\text{author}}$ (Journals). **[4]**

c) $\sigma_{\text{author = 'Shaanewako'}}$(Articles X Journals). **[4]**

d) $\rho_{\text{References}}(\sigma_{\text{subject = "database"}}(\text{Articles}))$. **[4]**

e) $\prod_{\text{subject, author}}$ (Articles). **[4]**

Question Five

a) Briefly describe the concepts of logical and physical data independence as used in databases systems. **[4]**

b) Your Database Administrator told you that you shouldn't forget to implement a locking protocol to safeguard execution of transactions. Define a lock and explain the two types of locks available in DBMSs. **[4]**

c) Describe any three features of a nested transaction and link these to some of the ACID properties of concurrency control. **[12]**

Question Six

a) Describe the following models of databases:

i. ER model. **[2]**

ii. Object oriented model. **[3]**

iii. Network model. **[3]**

iv. Hierarchical model. **[3]**

b) Write SQL code snippets for accomplishing the following:

i. Creating a new database to be called "*rabbitarydb.*" **[1]**

ii. Creating a table called "*buck*" and any two attributes and their data types. **[3]**

iii. Suppose you had forgotten to include the primary key when you coded (bii) above, now write an appropriate SQL code for including a Primary Key. **[2]**

iv. Write a statement for inserting any imaginary values into the table that you created in (bii) above. **[3]**

END OF EXAMINATION PAPER