THE UNIVERSITY OF ZAMBIA

School of Natural Sciences

Department of Computer Science

FINAL EXAMINATION

DATABASE SYSTEMS AND INFORMATION SYSTEMS
CSC 2702

Date:	11th NOVEMBER, 2022
Time:	09:00hrs – 12:00hrs
Duration:	3 Hours
Venue:	UPPER DINING HALL

Instructions

1. Choose and answer ***any FIVE (5) questions in this paper***

INSTRUCTIONS: ANSWER ANY FIVE (5) OF THE SIX QUESTIONS

Question 1

Consider the following relations forming part of relational database instance for company ABC.

Employee

empID	fName	lName	sex	position	salary	branchID
S1	Steve	Banda	M	Supervisor	1000	B2
S2	Sara	Bwalya	F	Manager	2500	B1
S3	Zikomo	Mbuya	M	Supervisor	1500	B1
S4	Dyonko	Tabesusha	F	Supervisor	1800	B2
S5	Piteni	Mukwayi	F	Supervisor	1600	B1
S6	Matusa	Kukiliya	M	Manager	2600	B3

Branch

branchID	branchName
B1	Mandahill
B2	Town Centre
B3	Arcades
B4	East park

i. Write the SQL statement that produces the following relation tables.

a.

FirstName	LastName	Salary
Steve	Banda	1000
Zikomo	Mbuya	1500
Dyonko	Tabesusha	1800
Piteni	Mukwayi	1600

b.

COUNT	SUM	MIN	MAX
2	5100	2500	2600
4	5900	1000	1800

c.

empID	fName	lName	sex	position	salary
S2	Sara	Bwalya	F	Manager	2500
S3	Zikomo	Mbuya	M	Supervisor	1500
S4	Dyonko	Tabesusha	F	Supervisor	1800
S5	Piteni	Mukwayi	F	Supervisor	1600
S6	Matusa	Kukiliya	M	Manager	2600

Course

Question 2 [20 Marks]

i. So you learnt about databases, explain the difference between a database and a table?
ii. If Waza says that his database displays both entity integrity and referential integrity, what does he mean?
iii. Explain in brief terms why the constraints in (ii) above are important for databases?
iv. In brief terms, what do you think composite entities are and when are they used?
v. Bob is designing a Student Information System (SIS) database and he notices that the COURSE entity is in a recursive relationship, what does he mean? Also give an example with respect to COURSE how it would be in a recursive relationship.

Question 3 [20 Marks]

i. In databases, some table structures are considered to be bad and others good. How do you recognize the difference between good and bad structures?
ii. How would you describe a condition in which one attribute is dependent on another attribute when neither attribute is part of the primary key?
iii. ~~Imagine you notice one attribute depending on another attribute but neither of them is part of the primary key, how would you describe this condition~~?
iv. Suppose that you hear Waza telling Musenge that an attribute that is part of a composite primary key is also a candidate key, how would you respond to that statement? Is he right or wrong? Justify!

Question 4 [20 Marks]

i. Antoinette wants to understand the difference between a table and a relation, could you list five (5) properties that differentiate the two?
ii. What three items in the database can be represented by null?
iii. State three (3) SQL functions that can be affected with the implementation of null in the definition of table structures.
iv. What is the difference between a data dictionary and a system catalog?
v. Define the following joins:
   a. Natural join
   b. Equijoin
   c. Theta join
   d. Outer join
   e. Inner join

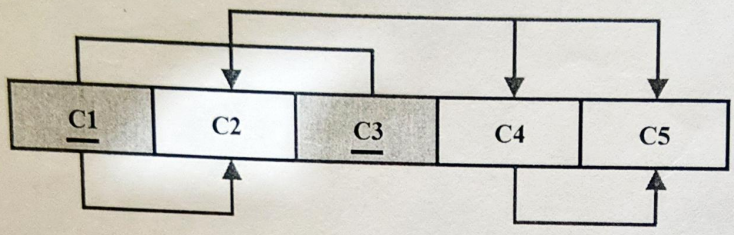
Question 5 [20 Marks]

i. Imagine you are asked by your boss the potential costs of implementing a database system, what four (4) reasons would you state?
ii. Explain why database design is important with focus on recent trends of managing data in information technology?
iii. Describe in brief terms what data redundancy is and give three (3) characteristics of file systems that lead to it.
iv. Do you thing file systems exhibit data dependence? Justify your answer!

Question 6 [20 Marks]

i. Define the following terms:
   a. Functional dependency
   b. Partial dependency
   c. Transitive dependency

ii. Consider the following dependency diagram and answer the follow up questions:



   a. Identify and discuss each of the indicated dependencies.
   b. Using the dependency diagrams, create database with tables that are at least in 2NF.
   c. Similarly, using the dependency diagrams, create a database whose tables are at least in 3NF.

Fin!