NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY FACULTY OF

FACULTY OF SCIENCE AND TECHNOLOGY EDUCATION

DEPARTMENT OF SCIENCE, MATHEMATICS AND TECHNOLOGY EDUCATION

PST 2176 DATABASE CONCEPTS AND DATA PROCESSING

Main Examination Paper
NOVEMBER/DECEMBER 2024

This Examination Paper consists of 4 pages

Time Allowed: 3 hours

Total Marks: 100

Internal Examiner: D. Khumalo

External Examiner: Dr B Moyo

INSTRUCTIONS

1. **Section A** is Compulsory. Answer **all** questions in **Section A**
2. Answer **only 3** questions from **Section B**
3. Each question carries 20 marks. Total Marks are 100

ADDITIONAL MATERIALS NEEDED

1. None

MARK ALLOCATION

QUESTION	MARKS
Section A	
1	20
2	20
Section B	
3	20
4	20
5	20
6	20
TOTAL	100

Section A [40 Marks]

Question One

a) Explain the following terms in relation to databases.

i. Normalization [2 Marks]
ii. Transitive dependency [2 Marks]
iii. Relation [2 Marks]
iv. Foreign key [2 Marks]
v. Data redundancy [2 Marks]

b) Discuss the advantages and disadvantages of using a database management system. [10 Marks]

Question Two

a) Explain with examples the three anomalies that are solved by the process of normalization.

[8 Marks]

b) Show the SQL code to create a table from the following schema:

STUDENT (StudNum, Surname, FirstName, DateOfBirth, Gender, Age);

Additional Information:
StudNum should hold a maximum of 5 characters and should be the Primary key, all the other fields can have any reasonable number of characters. The DateOfBirth should be formatted to show two digits each for year, month and day and the gender field should allow users to pick from "M" or "F".

[12 Marks]

Section B

Question Three

a) Discuss using a diagram the ANSI/SPARC architecture in database systems.

[10 Marks]

b) State and explain, giving examples of the four components of a database system.

[10 Marks]

Question Four

The following are the specifications for a college library management system.

"A member is allowed to borrow only 2 book sat a time. Books are published by publishers. A member has: name, address, joindate, memberID, phonenumber. A member can have more than one phone numbers and addresses. The membership account expires after a year and expiry date is calculated from joindate. The library wants to store the following information on books: bookID, author, title, availability. A publisher has PubID, PubAddress, Name. When a member borrows a book we want to store the dueDate, returnDate and fineamount (if book is overdue)."

Construct an ERD for the system and map the ERD to the relational model. Remember to show primary keys in your designs.

[20 Marks]

Question Five

Normalization is a database design technique that reduces data redundancy and eliminates objectionable characteristics. The table below is an example of unnormalized table. Design tables that conform to the:

i) 1NF

ii) 2NF

iii) 3NF

[20 Marks]

StdID	StudentNam e	DOB	Gender	CourseNu mber	CourseName	LecturerNumb er	LecturerNam e
12345	Ndlovu, R	20/08/83	M	EC6654	A-Level Computers	T345267	Khumalo, S
22433	Adams, T	03/02/83	F	EC6654 HM7756 AD1121	A-Level Computers A-Level Music Pottery	T345267 T773351 T876541	Khumalo, S Sibanda, K Nleya, T
66688	Nkomo, O	03/09/54	M	BM3390 HM7756	HNC Business A-Level Music	T666758 T773351	Newman, P Sibanda, K

Question Six

a) Explain any three threats to database systems giving examples of each. [6 Marks]

b) Discuss in detail the database lifecycle. In your account show all the stages involved and explain what happens at each stage. [14 Marks]

End of Paper