

NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY
FACULTY OF APPLIED SCIENCES
COMPUTER SCIENCE DEPARTMENT
MAY 2001 EXAMINATIONS

SUBJECT: DATA REPRESENTATION, FILES AND DATABASE SYSTEMS
CODE: SCS 2205

INSTRUCTIONS TO CANDIDATES

1. This question paper consists of seven (7) questions.
2. Answer any five (5) questions

3 HOURS

1. a) Outline the steps involved when converting an n-bit binary number into:
 - i) Radix (two's) complement form [2]
 - ii) Diminished radix (one's) complement form [2]
- b) Multiply 0111 and 0011 in binary mode. [6]
- c) What are the advantages and disadvantages of a database Management System (DBMS). [10]
2. a) Define a record and a file. [4]
- b) List the major functions of a Database Administrator (DBA). [6]
- c) Explain the differences between a file-oriented system and a database-oriented system. [10]
3. a) Give a formal definition of the three update operations that can be performed on files. [6]
- b) Why is data important to an organisation? How does an organisation that has better control of its data have a competitive edge over other enterprises? [8]
- c) Perform the following calculations on 8-bit Radix complement numbers.
 - i)
$$\begin{array}{r} 00000000 \\ - 11111111 \end{array}$$
 - ii)
$$\begin{array}{r} 11110111 \\ - 11110111 \end{array}$$
 [6]

4. a) Suppose you are given the following universal relation:

SYSTEM (BUILDING, FLOOR, OFFICE_NO, PERSON_ID, PROJECT, MANAGER)

The relation contains data on:

- The location of persons in the organisation.
- The departments responsible for projects
- The manager responsible for buildings
- The location of departments

The functional dependencies in the relation are:

PERSON_ID \longrightarrow FLOOR, OFFICE_NO, BUILDING, DEPT
PROJECT \longrightarrow DEPT
BUILDING \longrightarrow MANAGER
BUILDING, FLOOR \longrightarrow DEPT

- i) Draw a functional dependency diagram for the given universal relation. [7]
- ii) Decompose the given relation into 3NF. [8]
- b) Explain the differences between stacks and queues. [5]
5. a) Discuss the difference between the following file organisations.
- i) Sequential
ii) Index-sequential
iii) Hashed [15]
- b) Indicate how arrays (one-dimensional and multi-dimensional) are handled in C. [5]
6. a) Consider the supplier-Parts-Project database structure given below.

S (S#, SNAME, STATUS, CITY)

P (P#, PNAME, COLOUR, WEIGHT, CITY)

J (J#, JNAME, CITY)

SPJ (S, P#, J#, QTY)

Key

S = supplier Table

P = Parts Table

J = Projects Table

Write SQL statements for:

- i) Get full details of all projects
 - ii) Get full details of all projects in Bulawayo
 - iii) Get all shipments where the quantity is in the range 300 to 750 inclusive. [9]
- b) Define the following giving examples:
- i) Data manipulation language (DML)
 - ii) Data definition language (DDL) [6]
- c) What is the importance of outflow blocks in sequential and indexed sequential file organizations? [5]
7. a) Give a detailed description of each of the three levels of the ANSI/SPARC model. Your answer must include details on data independence. [10]
- b) Given the E-R diagram on the next page:
- i) For each relation, choose a suitable name and list corresponding attributes, underlining the primary key. [5]
 - ii) For each relation, identify the foreign keys. [5]

