



NATIONAL OPEN UNIVERSITY OF NIGERIA
University Village, 91 Cadastral Zone, Nnamdi Azikwe Expressway, Jabi, Abuja
FACULTY OF SCIENCES
COMPUTER SCIENCE DEPARTMENT
2021_2 EXAMINATIONS

DAM 461: STATISTICAL DATABASE SYSTEM

Credit: 3 units

TIME ALLOWED: 2½ Hours

INSTRUCTION: Answer Question 1 and any other FOUR (4) Questions

1a(i) What is a conceptual schema? **(1 mark)**

1a(ii) List the four phases of a database design. **(2 marks)**

1b) Consider the following information about a university database: **(8 marks)**

- Professors have an SSN, a name, an age, a rank, and a research specialty.
- Projects have a project number, a sponsor name (e.g., TETFUND, NITDA), a starting date, an ending date, and a budget.
- Graduate students have an SSN, a name, an age, and a degree program (e.g., B.Sc. or M.Sc.).
- Each project is managed by one professor (known as the project's principal investigator).
- Each project is worked on by one or more professors (known as the project's co-investigators).
- Professors can manage and/or work on multiple projects.
- Each project is worked on by one or more graduate students (known as the project's research assistants).
- When graduate students work on a project, a professor must supervise their work on the project. Graduate students can work on multiple projects, in which case they will have a (potentially different) supervisor for each one.
- Departments have a department number, a department name, and a main office.
- Departments have a professor (known as the chairman) who runs the department.
- Professors' work in one or more departments and for each department that they work in, a time percentage is associated with their job.
- Graduate students have one major department in which they are working on their degree.
- Each graduate student has another, more senior graduate student (known as a student advisor) who advises him or her on what courses to take.

Design using an ER diagram that captures the information about the university. Use only the basic ER model here; that is, entities, relationships, and attributes. Be sure to indicate any key and participation constraints.

1c(i)) Explain the important roles played by the following in representing information about the real world in a database (7 marks)

- i) The data definition language.
- ii) The data manipulation language.

- iii) The buffer manager.
 - iv) The data model.
- 1c(ii) What is a DBMS and explain eight (8) of its functions? **(4 marks)**
- 2(a) Answer the following questions: **(4 marks)**
- I What is a transaction? **(1 mark)**
 - ii Why does a DBMS interleave the actions of different transactions instead of executing transactions one after the other?
 - iii What must a user guarantee with respect to a transaction and database consistency? What should a DBMS guarantee with respect to concurrent execution of several transactions and database consistency? **(1 mark)**
 - iv Explain the strict two-phase locking protocol.
- 2(b) Explain the following terms briefly: attribute, domain, entity, relationship, entity set, relationship set, one-to-many relationship, many-to-many relationship. **(4 marks)**
- 2c) With the aid of a diagram, describe the physical centralized architecture of a DBMS. **(4 marks)**
- 3a) State any five (5) characteristics of a database approach? **(5 marks)**
- 3b) Mention seven (7) advantages of using DBMS. **(7 marks)**
- 4a) What is a transaction? What are its properties? Why are transactions important units of operation in a DBMS? **(5 marks)**
- 4b) How does the DBMS ensure that the transactions are executed properly? **(2 marks)**
- 4c(i) What is a consistent database state and how is it achieved? **(2 marks)**
- 4c(ii) Define the following terms: **(3 marks)**
- I. Microdata
 - II. Macrodata
 - III. and Metadata
- 5a) What is Data Independence? Discuss two levels of data independence. **(5 marks)**
- 5b) List and discuss two categories of DBMS languages. **(4 marks)**
- 5c) Explain six (6) components of a database environment. **(3 marks)**

- 6a) Compare and contrast the two-tier client-server architecture with three-tier client-server architecture. **(4 marks)**
- 6b) What is the difference between entity types and entity sets? **(4 marks)**
- 6c) List and explain the two contexts of a statistical database. **(4 marks)**