9210-124
Level 6 Graduate Diploma in Engineering
Database management

Sample Paper

	You should have the following for this examination	**No additional data is attached**
	• one answer book	
	• non-programmable calculator	
	• pen, pencil, ruler	

General instructions
• This examination paper is of **three hours** duration.
• This examination paper contains **nine** questions.
• Answer **any five** questions.
• All questions carry equal marks. The maximum marks for each section within a question are given against that section.
• An electronic, non-programmable calculator may be used, but the candidate **must** show clearly the steps prior to obtaining final numerical values.
• Drawings should be clear, in good proportion and in pencil. Do **not** use red ink.

1 a) Give **five** disadvantages of a file system. (5 marks)
   b) Give **five** main components of a database management system
      (DBMS) environment. (5 marks)
   c) Describe the three-schema architecture of a DBMS. (4 marks)
   d) Allocate the following operations into the three levels you mentioned in c).
      i) Transfer a table from the database into an external device.
      ii) Retrieve a student list whose marks are below 40.
      iii) Define the attributes of a table. (6 marks)

2 a) Give **five** characteristics of a Database Management System (DBMS). (5 marks)
   b) There are teachers, support staff and students available in an institute. Teacher
      Mali is 36 years old and her employment id is T91. Jim is a staff member with
      employment id E42 and he is 21 years old. Jenny, Jerome and Sarha are
      18, 17 and 20 years old respectively. They have registered for a computer
      technology course. Jerome is a male student. Their student numbers are
      S03, S08 and S45.
      Identify two tables and attributes of the sample database according to the above
      description. Populate these tables with available data. (10 marks)
   c) Classify the following data fields into simple attribute or composite attribute.
      i) Full Name.
      ii) Address.
      iii) Eye colour.
      iv) Weight in kg.
      v) Email address. (5 marks)

3 a) Briefly describe the program-data independence. (4 marks)
   b) Compare and contrast a transaction and a record update. (4 marks)
   c) What is meant by a database view? (4 marks)
   d) An animal shop sells dogs, rabbits and pigeons. This shop maintains a DBMS to
      keep the stock and sales records. Once any animal is sold, stock record will be
      updated. The shop owner is able to see the daily sales report very easily. The
      details of buyers' are also recorded in the database with respect to the animal
      they buy. Derive table structures with suitable fields including keys. (8 marks)

4 a) What is expressed by an E-R (Entity Relationship) Model? (4 marks)
   b) An animal Zoo contains many different animal types (Animal types). A separate
      employee (Employee) manages each animal type. Each animal type has one or
      more animals from same type (Animal). Employees provide their services in
      different ways; each of the following situations concerns a data relationship set.
      For each situation below, draw an ER diagram that describes it (assuming no
      further constraints hold). (Ex: One animal type may be Elephant; Animals may
      be African Elephant, Indian Elephant etc.
      i) Employee can take care of only one animal type. (4 marks)
      ii) Employee can take care of several animal types. (4 marks)
      iii) Considering that, certain animal types are to be managed by a group of
           Employees where it is not an individual task. Further, the animals within
           any type have individual identities. Derive an ER diagram by considering
           this scenario together with the case given in 4 b) ii). You should suggest
           relevant keys. (8 marks)

5 a) An organization database system is to be established with the following entities
      and attributes.
      Employee (id_card, First_name, Last_name, Birth_date, Address, Sex, Salary)
      Project (P_id, Project_name, Location)
      Write SQL statements that create tables corresponding to the above information.
      Generate additional relation tables if required. State any assumptions if applicable.   (12 marks)
   b) Assume that there are two new records to be inserted to Employee entity.
      Write SQL statement to insert the records. You may assume the attribute
      values accordingly.   (4 marks)
   c) Write a SQL statement to remove the attribute Location of the Project table.   (4 marks)

6 a) What is a derived attribute? Give an example.   (4 marks)
   b) Describe properties of a composite attribute.   (4 marks)
   c) Use the following relations when answering questions in this section.
      Repayment (borrower_id, name, address, loan_amount, request_date,
      repayment_date, repayment_amount)
      Loan (loan_id, borrower_id, interest, loan_type, number_installments, installment)
      i)   Write SQL statements to show the *borrower_id* and the *name* of all the
           borrowers if their *loan amount* is higher than Rs. 400,000.   (4 marks)
      ii) Write a SQL statement to display the list of names of borrowers under the
           loan type of '*University Staff Loan*'.   (8 marks)

7 a) Describe the state of 3rd Normal Form (3NF) of a RDBMS.   (4 marks)
   b) What is meant by read authorization in a database?   (4 marks)
   c) Why are DBMS views important in data protection?   (4 marks)
   d) Describe the operation of the following SQL statements
      i)   DELETE FROM EMPLOYEE WHERE L name='John';   (4 marks)
      ii) UPDATE PROJECT SET P location = 'Berlin', Dnum = 3 WHERE Pnumber=11;   (4 marks)

8 a) What is meant by the Consistency property of a Database Transaction?   (4 marks)
   b) Describe how Distributed Database System (DDS) differs from Centralized
      Database System.   (4 marks)
   c) What is meant by Replication Transparency in DDS?   (4 marks)
   d) Provide **four** advantages of a Distributed Database System.   (4 marks)
   e) Give the two additional functions attached to a DDS when compared with
      generic DBMS.   (4 marks)

9 a) What is meant by Shared disk (loosely coupled) architecture in a database system?   (5 marks)
   b) Which of the following passwords are advisable to be used in a database and why?
      i)   Viagra
      ii) Doggie
      iii) Iprv5Ctl!
      iv) 97531
      v)   W@12thiu   (5 marks)
   c) Describe the following scenario technically with correct terms.
      When committing a transaction that is accessing databases stored on multiple
      sites there have been problems. It has been observed that a few sites have failed
      during this committing process.   (5 marks)
   d) Propose a solution for the problem in 9c).   (5 marks)