Candidates are required to answer **THREE** questions.
All questions carry equal marks.
Time allowed: **TWO hours**

1.

   (i)   Describe what is meant by each of the following:
- Primary storage and secondary storage.
- File blocks and blocking factor.

   (ii)   With the aid of a diagram describe the main components of a magnetic disk. Describe the stages involved in accessing a disk block on a magnetic disk, given the block address.

   (iii)   What is meant by *indexed file organisation*? With the aid of an example, distinguish between dense and non-dense indexes.

2.

(i) Distinguish between the traditional file processing approach and the database approach, describing the advantages and disadvantages of each approach.

(ii) Describe the main concepts of the relational data model.

(iii) With the aid of examples, describe the following:
    (a) composite, atomic and derived attributes.
    (b) single-valued and multi-valued attributes.
    (c) entity integrity constraints and referential integrity constraints.

3.

(i) HTML is an example of a mark-up language. Explain what is meant by a *mark-up* language, giving some examples of the language (HTML) to support your answer.

(ii) With respect to the principles of user interface design, discuss the desirable HCI (Human Computer Interaction) requirements of a web site. Use examples from web interfaces with which you are familiar to support your answer.

(iii) With the aid of a diagram describe the main components of an Information Retrieval system. Describe what is meant by the terms *stemming* and *stop word removal*.

4.

(i) Discuss the desirability, or otherwise, of a SQL standard. In your answer, discuss problems that may arise if a SQL version does not conform fully to a SQL standard.

(ii) What is meant by query processing? With the aid of a diagram, describe the main steps involved in processing a query.

(iii) Evaluation of an SQL SELECT statement often requires the implementation of a search method to search for records that satisfy some selection condition. Outline the steps involved in both a linear search and a binary search approach.

5.

(i) What is meant by a view? Discuss the advantages and disadvantages of using views.

(ii) Given the following relational schema and interpretation with keys underlined:

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TOURS(Code, Type, Location, DepartDate, Duration)
LOCATION(LocationName, SummerTemp, WinterTemp, TimeZone)
CUSTOMER(ID, Surname, Firstname, Address, PhoneNum)
BOOKINGS(CustID, TourCode, No_of_People)
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A travel company offers a number of TOURS, where each tour has an associated, unique code (Code), is of a certain type (e.g. skiing, beach, etc.), is located in a certain location and has a fixed departure date and duration (number of days of the tour). The LOCATION relation holds information on tour locations: a unique location name (LocationName), an associated average summer and winter temperature and a time zone. The details held on customers in the CUSTOMER relation are: ID, first name, surname, address and phone number. The relation BOOKINGS holds details of bookings made by a customer: the primary key is the customer ID and the code of the tour they have booked. Details are also kept on the number of people booked by the customer for that tour (e.g., 1, 2, etc.). TourCode is a foreign key to Code in relation TOURS.

Develop SQL queries to satisfy the following information needs:

a) List the location and departure date of all tours of type 'beach' whose duration is greater than 5 days and less than 10 days.

b) List the total number of people who are booked for tours of type 'hiking'.

c) List the customer name, and number of people booked by that customer, for a tour of type 'beach' where the average summer temperature in the beach locations is greater than 22°C.

d) For each tour type, list the average duration of the tours offered by the company.

e) List the name and address of all customers who have booked the same tour as customer 'Jasper Smith'.