QUESTION 1.

3 **(a)** A particular programming language allows the programmer to define their ow

`ThisDate` is an example of a user-defined structured data type.

```
TYPE ThisDate
   DECLARE ThisDay    :  (1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12,
                         13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23,
                         24, 25, 26, 27, 28, 29, 30, 31)
   DECLARE ThisMonth  :  (Jan, Feb, Mar, Apr, May, Jun, Jul, Aug,
                         Sep, Oct, Nov, Dec)
   DECLARE ThisYear   :  INTEGER
ENDTYPE
```

A variable of this new type is declared as follows:

```
DECLARE DateOfBirth : ThisDate
```

(i) Name the non-composite data type used in the `ThisDay` and `ThisMonth` declarations.

.....[1]

(ii) Name the data type of `ThisDate`.

.....[1]

(iii) The month value of `DateOfBirth` needs to be assigned to the variable `MyMonthOfBirth`.

Write the required statement.

.....[1]

(b) Annual rainfall data from a number of locations are to be processed in a prog

The following data are to be stored:

- location name
- height above sea level (to the nearest metre)
- total rainfall for each month of the year (centimetres to 1 decimal place)

A user-defined, composite data type is needed. The programmer chooses `LocationRainfall` as the name of this data type.

A variable of this type can be used to store all the data for one particular location.

(i) Write the definition for the data type `LocationRainfall`.

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.....[5]

(ii) The programmer decides to store all the data in a file. Initially, data from 27 locations will be stored. More rainfall locations will be added over time and will never exceed 100.

The programmer has to choose between two types of file organisation. The two types are serial and sequential.

Give **two** reasons for choosing serial file organisation.

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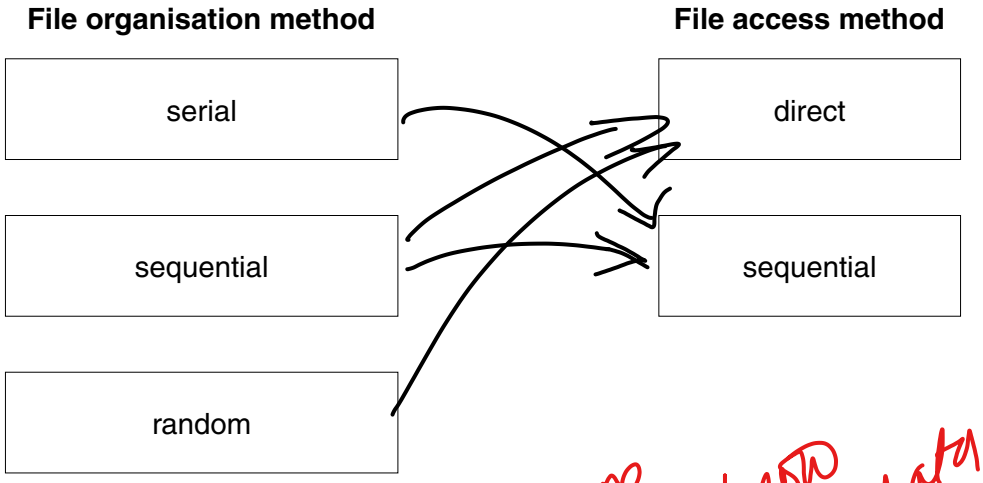
.....[2]

QUESTION 2.

4 **(a)** Three file organisation methods and two file access methods are shown belo

Draw lines to link each file organisation method to its appropriate file access methods.



[4]

Since sequential files are ordered, you can know where the data you want is exactly so. random access might be possible

(b) A bank has a very large number of customers. The bank stores data for eac
includes:

- unique customer number
- personal data (name, address, telephone number)
- transactions

for each customer

The bank computer system makes use of three files:

- A – a file that stores customer personal data. This file is used at the end of each month for the production of the monthly statement.
- B – a file that stores encrypted personal identification numbers (PINs) for customer bank cards. This file is accessed when the customer attempts to withdraw cash at a cash machine (ATM).

used a lot

- C – a file that stores all customer transaction records for the current month. Every time the customer makes a transaction, a new record is created.

as they arrive

For each of the files A, B and C, state an appropriate method of organisation. Justify your choice.

(i) File A organisation ... Sequential ...

Justification ... processed in batch for each customer at end ... not accessed in random order ... can be ordered based on id/account no ...[3]

(ii) File B organisation ... Random ...

Justification ... Used in real time needs fast processing and waste time searching linearly. ...[3]

(iii) File C organisation ... Serial ...

Justification ... Append at end ... In chronological order ... Might not be accessed a lot, even if it is, it is accessed based on time ...[3]

QUESTION 3.

4 **(a)** Three file organisation methods and two file access methods are shown bel

Draw lines to link each file organisation method to its appropriate file access meth

File organisation method	File access method
random	sequential
serial	direct
sequential	

[4]

(b) An energy company supplies electricity to a large number of customers. Each customer has a meter that records the amount of electricity used. Customers submit meter readings using their online account.

The company's computer system stores data about its customers.

This data includes:

- account number
- personal data (name, address, telephone number)
- meter readings
- username and encrypted password.

The computer system uses three files:

File	Content	Use
A	Account number and meter readings for the current month.	Each time a customer submits their reading, a new record is added to the file.
B	Customer's personal data.	At the end of the month to create a statement that shows the electricity supplied and the total cost.
C	Usernames and encrypted passwords.	When customers log in to their accounts to submit meter readings.

For each of the files A, B and C, state an appropriate file organisation me
given in the table.

All three file organisation methods must be different.

Justify your choice.

(i) File A organisation .....

Justification .....

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.....

.....[3]

(ii) File B organisation .....

Justification .....

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.....[3]

(iii) File C organisation .....

Justification .....

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.....[3]

QUESTION 4.

5 A weather station uses monitoring and control systems.

(a) Describe the difference between a monitoring system and a control system.

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..... [2]

(b) **(i)** The weather station records how the outside temperature changes over a period of time. The system will read the temperature once every hour, over a period of 100 days.

The temperature readings are automatically stored in a file. No other data are stored.

Explain why the weather station has decided to use serial organisation for the file.

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..... [2]

(ii) Serial files can be accessed using sequential access.

Explain how sequential access could be used for the temperature readings file.

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..... [2]

(iii) Name **and** describe a method of file organisation other than serial or sequential.

Method .....

Description .....

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[4]