1. Nov/2021//Paper_31/No.1

   (a) Numbers are stored in a computer using floating-point representation with:

   - 12 bits for the mantissa
   - 4 bits for the exponent
   - two's complement form for both the mantissa and exponent.

   (i) Write the normalised floating-point representation of the following unsigned binary number using this system.

   <div align="center">

   1011100.011001

   </div>

   Working ....

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   ....

   ....

Mantissa	**Exponent**

   [2]

   (ii) State the consequence of storing the binary number in **part (a)(i)** as a floating-point number in this system. Justify your answer.

   Consequence ....

   ....

   Justification ....

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   ....

   [2]

(b) Explain the reason why binary numbers are stored in normalised form.

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.... [3]
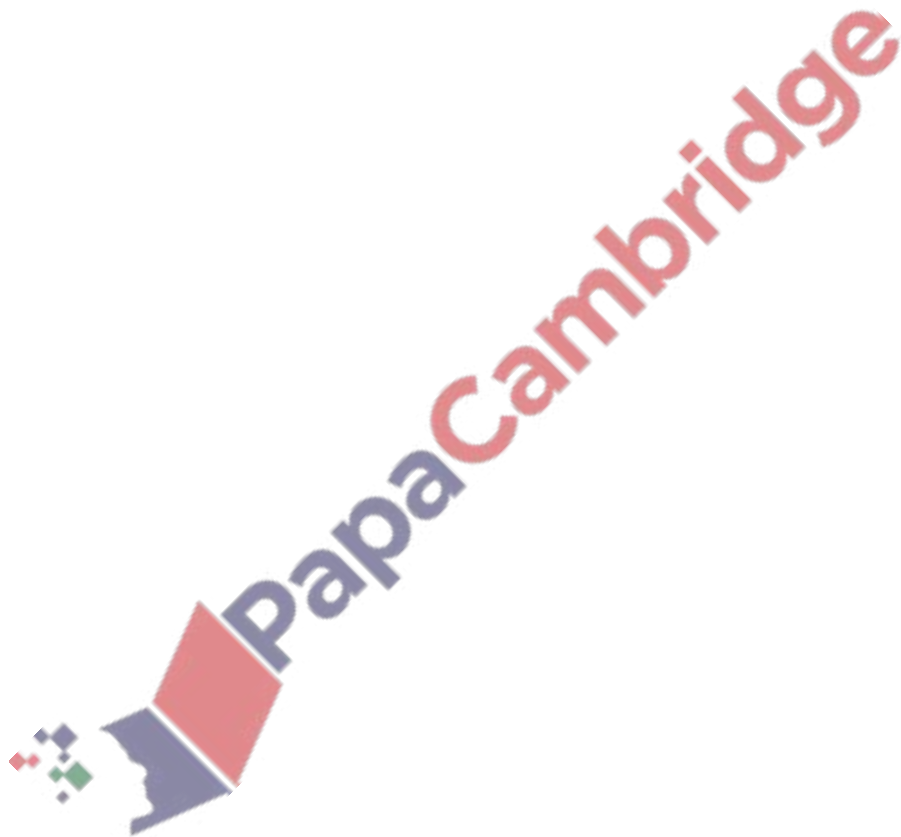
2.

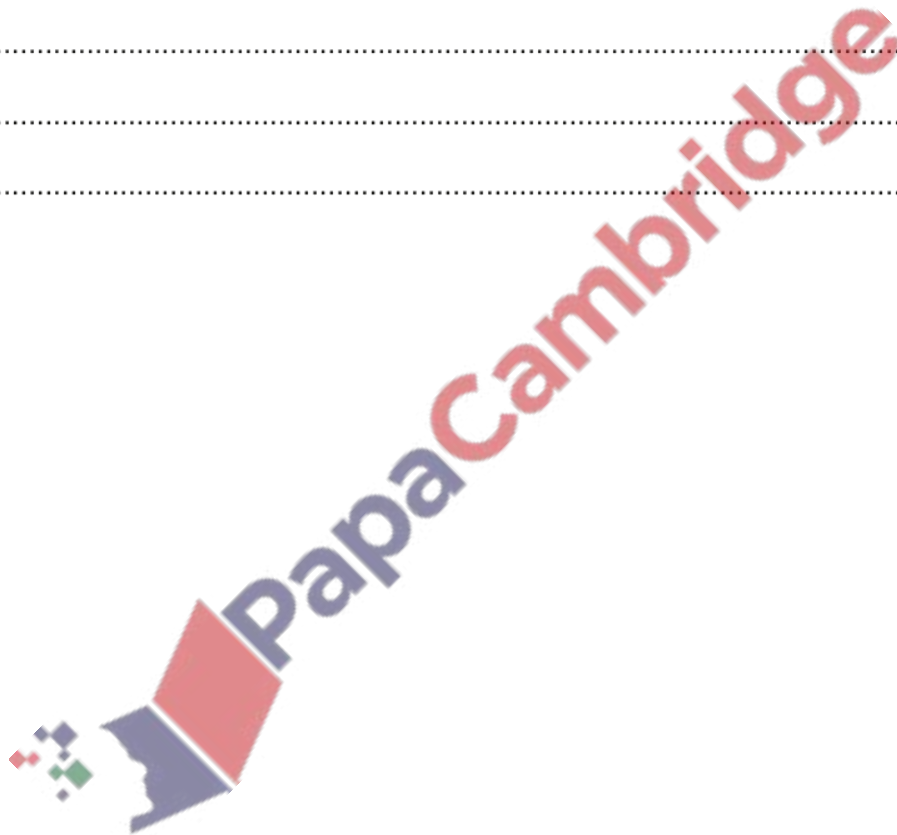Enumerated and pointer are two non-composite data types.

(a) Write **pseudocode** to create an enumerated type called `Parts` to include these parts sold in a computer shop:

`Monitor, CPU, SSD, HDD, LaserPrinter, Keyboard, Mouse`

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.... [2]

(b) Write **pseudocode** to create a pointer type called `SelectParts` that will reference the memory location in which the current part name is stored.

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.... [2]

(a) Compare sequential and serial methods of file organisation.

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.... [4]
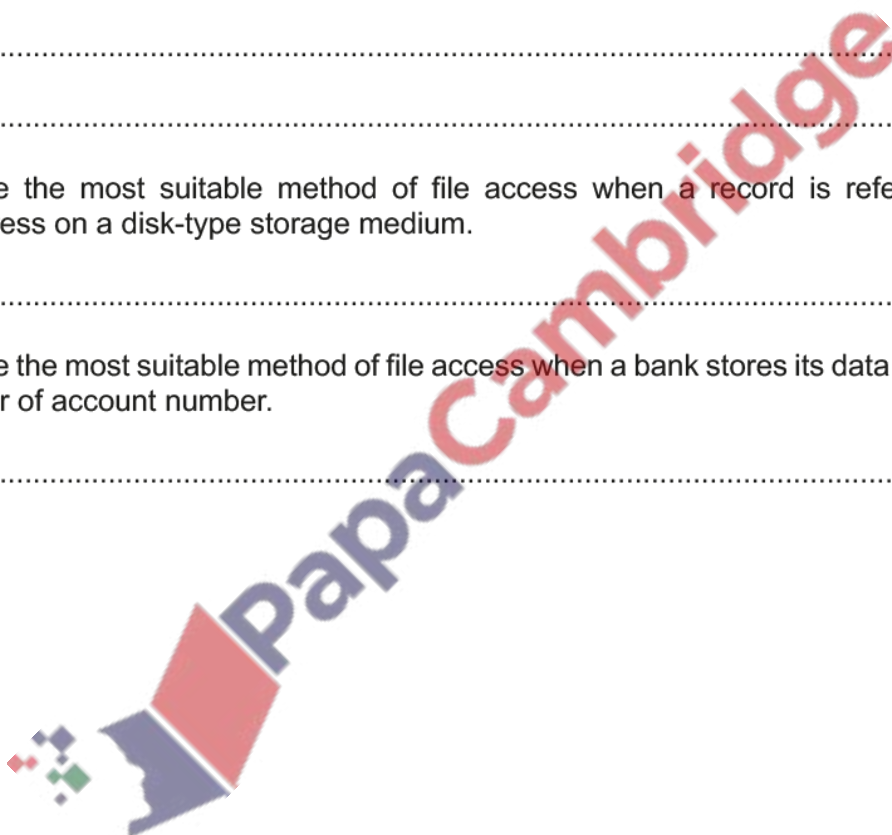
(b) State the most suitable method of file access when a record is referenced by a unique address on a disk-type storage medium.

.... [1]

(c) State the most suitable method of file access when a bank stores its data records in ascending order of account number.

.... [1]

4.
Real numbers are stored in a computer system using floating-point representation with:

- 10 bits for the mantissa
- 6 bits for the exponent
- Two's complement form for both the mantissa and the exponent.

(a) Calculate the normalised floating-point representation of –7.25 in this system.
Show your working.

Mantissa   **Exponent**

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Working ....

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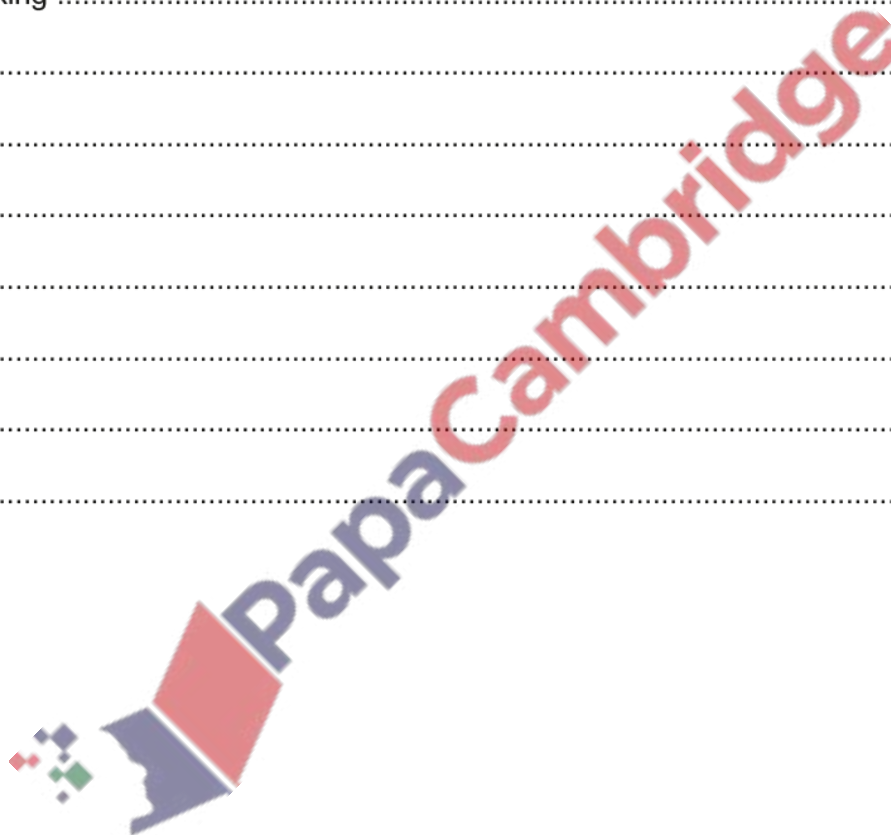
[3]

(b) Calculate the denary value of the given binary floating-point number.
Show your working.

	Mantissa										Exponent					
1	0	1	1	0	0	0	1	1	1		0	0	0	1	1	1

Working ....

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....

....

....

Answer ....
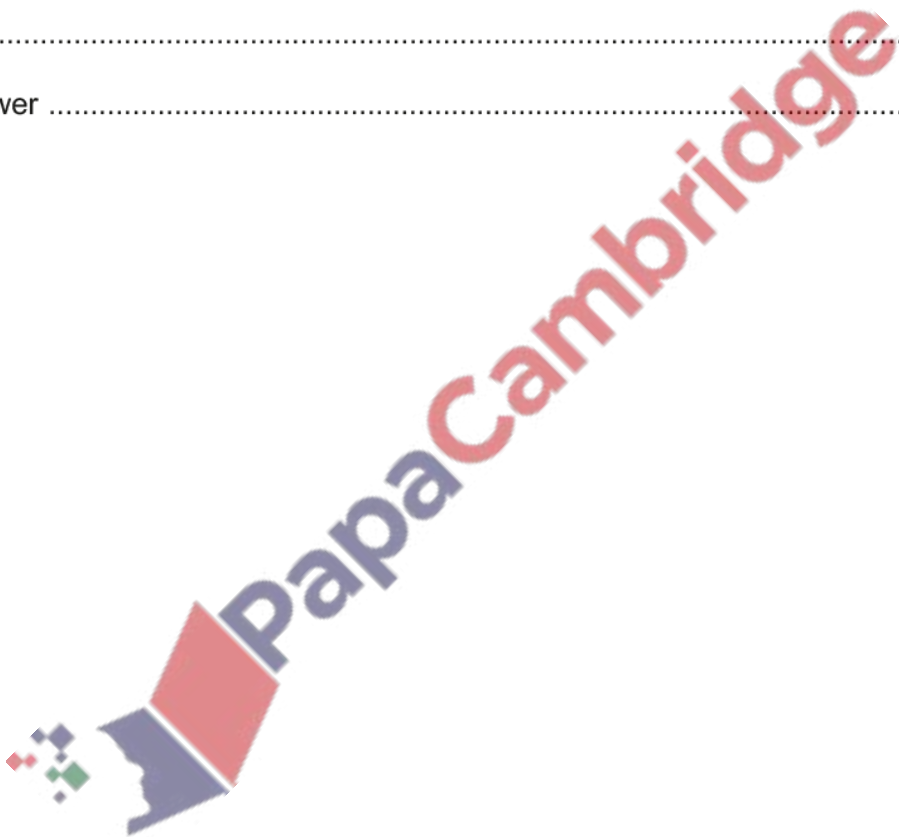
[3]

(c) The given binary floating-point number is not normalised.

Normalise the floating-point number. Show your working.

Mantissa

0	0	0	0	0	0	0	1	1	1

Exponent

1	0	0	1	1	1

Mantissa

Exponent

Working ....

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[3]

(d) The denary number 513 cannot be stored accurately as a normalised floating-point number in this computer system.

(i) Explain the reason for this.

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.... [3]

(ii) Describe an alteration to the way floating-point numbers are stored to enable this number to be stored accurately using the same total number of bits.

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5.

   (a) Describe the purpose of a user-defined data type.

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   .... [2]

   (b) Define, using pseudocode, the following enumerated data types:

   (i) SchoolDay to hold data about the days students are usually in school.

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   .... [1]

   (ii) WeekEnd to hold data about the days that are not school days.

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   .... [1]

   (c) Define, using pseudocode, the composite data type ClubMeet. This will hold data about club members that includes:

   - first name and last name
   - the two days they attend:
     - one on a school day
     - one not on a school day.

   Use the enumerated types you created in **part (b)**.

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