

CANDIDATE  
NAME

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CENTRE  
NUMBER

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CANDIDATE  
NUMBER

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## Secondary – 6

Computer Science

9618/32

Paper 3 - Advanced Theory

9<sup>th</sup>, August 2024

1 hour

You must answer on the question paper.

No Additional Materials are needed.

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### INSTRUCTIONS

- Answer **all** questions.
- Use a black or dark blue pen.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do not use an erasable pen or correction fluid.
- Do not write on any bar codes.
- You may use an HB pencil for any diagrams, graphs or rough working.
- Calculators must **not** be used in this paper.

### INFORMATION

- The total mark for this paper is **40**.
- The number of marks for each question or part question is shown in brackets [ ].
- No marks will be awarded for using brand names of software packages or hardware.

<b>For teacher's use only</b>

*This document consists of 7 pages*



1. 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

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
0	0
1	0
1	1
0	1
0	1
0	1
1	
1	
1	

Working.....

.....

.....

.....

.....

Answer.....

[3]

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

Normalise the floating-point number. Show your working.

Mantissa									Exponent						
0	0	0	0	0	0	0	1	1	1	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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..... [2]

2(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)**.

[4]

**3. Write any two difference between the Sequential file organisation and Random file organisation?**

[illegible]

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..... [4]

4. Data types can be defined using pseudocode.

The data type, BuildingRecord, is defined in pseudocode as:

```
TYPE BuildingRecord
  DECLARE BuildingID : INTEGER
  DECLARE BuildingGroup : STRING
  DECLARE OwnerName : STRING
  DECLARE BuildingAddress : STRING
  DECLARE DateLastSold : DATE
  DECLARE PriceLastSold : REAL
ENDTYPE
```

A variable, BuildingRegister, is declared in pseudocode as:

```
DECLARE BuildingRegister : BuildingRecord
```

(a) Write pseudocode statements to assign:

- 1067 to the BuildingID of BuildingRegister
- house to the BuildingGroup of BuildingRegister

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..... [2]

**(b)** The type definition for BuildingRecord is changed. The data type for BuildingGroup is changed to an enumerated type, BuildingType, with values of house, bungalow, apartment and farm.

(i) Write the type declaration for BuildingType in pseudocode.

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..... [2]

(ii) Write the new declaration for BuildingGroup in pseudocode.

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..... [1]

(iii) Write the new pseudocode statement to assign house to BuildingGroup of BuildingRegister.

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..... [1]

**5.** Numbers are stored in a computer using floating point representation with:

- 10 bits for the mantissa
- 6 bits for the exponent
- two's complement form for both the mantissa and exponent.
  - Describe the reason why the normalised form of the following binary number cannot be represented accurately using this system.

**0101011.111001**

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..... [4].

**6.** Describe how records are organised and accessed in a sequential file.

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