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CAMBRIDGE
International Education

Cambridge International AS & A Level

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

T8902721274

COMPUTER SCIENCE **9618/32**

Paper 3 Advanced Theory **May/June 2026**

1 hour 30 minutes

You must answer on the question paper.

No additional materials are needed.

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. Do **not** use correction fluid or tape.
- 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 75.
- 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.

This document has **16** pages. Any blank pages are indicated.

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[Turn over

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1 A user-defined data type is required to store the types of animals in a children's zoo.

(a) Write the pseudocode statement to declare a non-composite data type, `Animals`, that holds the following data:

Alpaca, Chicken, Donkey, Duck, Goat, Pony, Sheep

.....

.....

.....

..... [2]

(b) **(i)** State the type of user-defined non-composite data type created in **1(a)**.

..... [1]

(ii) Give **two** features that would apply to any list used in the data type in **1(a)**.

1 .....

.....

2 .....

.....

[2]

2 Complete the following paragraph using the **most appropriate** words from the given list.

Some words are **not** used.

application	**controls**	**disconnects**	**four**
interconnects	**internet**	**link**	**lists**
many	**packets**	**seven**	**transport**

The TCP/IP protocol suite consists of ..... layers which can be thought of as a stack. It is designed to send ..... of data across the internet. It is also used as a communications protocol to ensure accurate delivery of data over private networks.

The lowest layer of the stack is the ..... layer. This is the layer that ..... nodes in the network.

[4]

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3 Numbers are stored in a computer system using binary floating-point representation with:

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

(a) Calculate the denary value of the given normalised binary floating-point number.

Show your working.

mantissa												exponent			
1	0	1	1	0	1	0	0	0	1	1	0	0	1	1	0

working .....

.....

.....

.....

.....

denary value .....

[3]

(b) Describe **one** example of a situation that could cause underflow to occur and the consequences of this underflow.

.....

.....

.....

..... [2]

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4 **(a)** State **one** example of where sequential file organisation could be used.

.....

..... [1]

(b) Describe how records are organised in sequential files.

.....

.....

.....

..... [2]

(c) Outline the process of sequential file access to find a record in a sequential file.

.....

.....

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.....

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..... [3]

5 Explain what is meant by the term virtual machine.

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..... [4]

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6 **(a)** Write this infix expression in Reverse Polish Notation (RPN).

```
16 + ((9 - 7) / (18 + 6))
```

.....

.....

.....

..... [2]

(b) Write this RPN expression in infix form.

```
6  15 + 20  3 - - 27  9 * /
```

.....

.....

.....

.....

.....

..... [3]

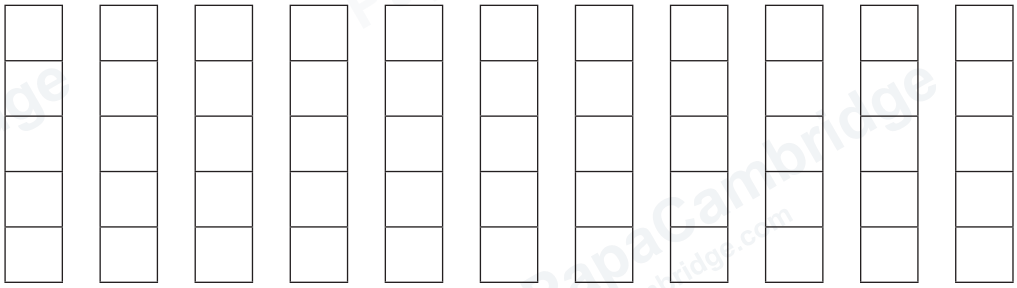
(c) The RPN expression

```
c a b - * b c + / d *
```

is to be evaluated, where:

`a = 8`, `b = 2`, `c = 10` and `d = 18`.

Show the changing contents of the stack as the RPN expression is evaluated.



[4]

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7 This truth table represents a logic circuit.

INPUT				OUTPUT
A	B	C	D	Z
0	0	0	0	0
0	0	0	1	1
0	0	1	0	0
0	0	1	1	0
0	1	0	0	1
0	1	0	1	1
0	1	1	0	1
0	1	1	1	1
1	0	0	0	0
1	0	0	1	1
1	0	1	0	0
1	0	1	1	0
1	1	0	0	1
1	1	0	1	1
1	1	1	0	1
1	1	1	1	1

(a) (i) Complete the Karnaugh map (K-map) for the given truth table.

CD \ AB	00	01	11	10
00				
01				
11				
10				

[2]

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(ii) Draw loop(s) around appropriate group(s) in the K-map to produce an optimal sum-of-products. [2]

(iii) Write the Boolean expression from your answer to **7(a)(ii)** as a simplified sum-of-products.

.....

..... [1]

(b) Simplify the following expression using De Morgan's laws and Boolean algebra.

Show all the stages in your simplification.

$$X = \overline{\overline{A}.B.C.\overline{D}} + \overline{\overline{A.D}}$$

.....

.....

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.....

..... [3]

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8 **(a)** Describe the differences between symmetric key and asymmetric key cryptography.

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.....

.....

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..... [3]

(b) Outline the process that would allow a business to use encryption keys to send a verified message to a group of people.

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..... [4]

9 **(a)** State the subset of Artificial Intelligence (AI) which makes use of an artificial neural network.

..... [1]

(b) The A* and Dijkstra's algorithms are used to perform searches on a graph.

(i) Outline how the A* algorithm is different from Dijkstra's algorithm.

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..... [3]

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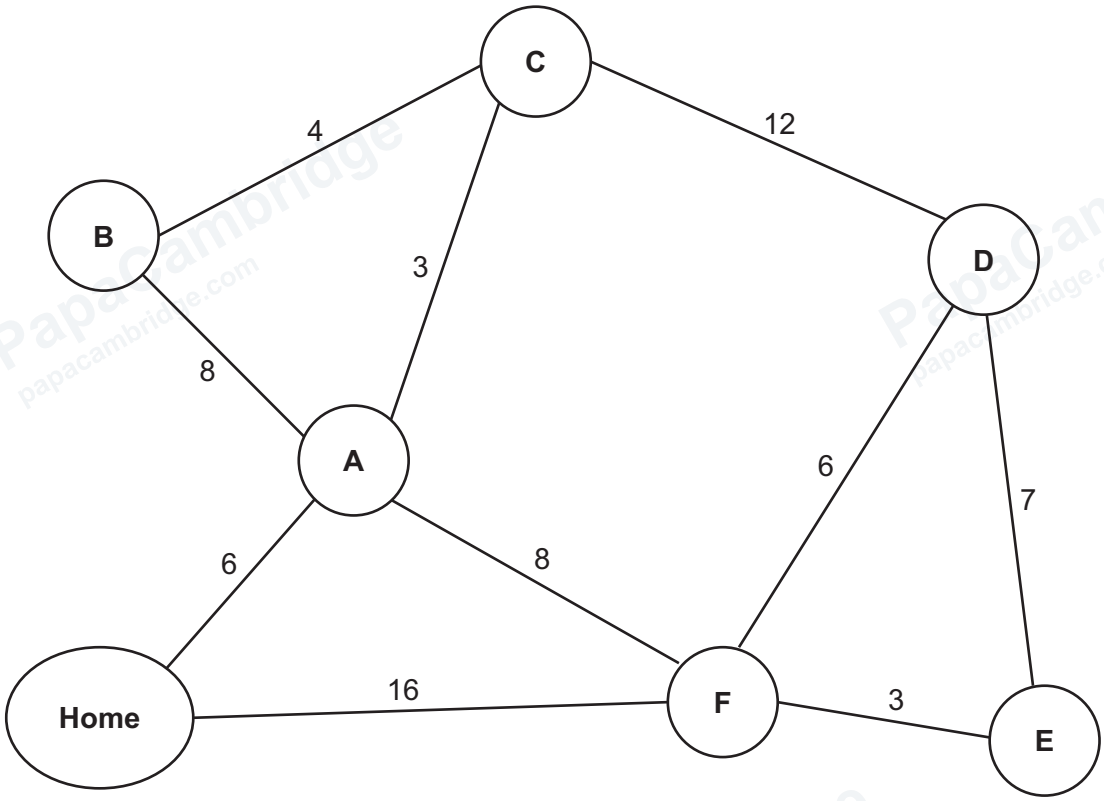
(ii) Calculate the best path between the Home node and each of the nodes in the diagram using Dijkstra's algorithm.

Show your working and write your answers in the table provided.



working .....

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Answers:

A	B	C	D	E	F

[5]

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10 (a) Two examples of searching algorithms are a linear search and a binary search.

Describe how increasing the number of data items in the file to be searched affects the time efficiency of these search algorithms. Refer to Big O notation in your answer.

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..... [3]

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(b) A temperature in degrees Celsius (°C) is recorded every minute for **one** day in a random file, `Temperatures.dat`.

A function is required to find the temperature for a specific time in the day to check if it was freezing. The position of each temperature in the file corresponds to the number of minutes after midnight, for example, the temperature at 10:00 am would be stored at position 600 (10 × 60).

Write the pseudocode to complete the algorithm to check a temperature stored in `Temperatures.dat`, by passing its position in the file as a parameter and using file handling commands to find the relevant data item. Once the temperature is found, it is checked to see if it is above or below freezing, and an appropriate message is returned.

Some of the blank lines may **not** be used.

```
FUNCTION TempCheck( .....
   DECLARE Temperature : REAL
   DECLARE Response : STRING

   OPENFILE .....

   .....

   .....

   .....

   .....

   .....

   .....

   .....

   .....

   .....

   .....

   .....

ENDFUNCTION
```

[6]

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11 (a) Object-Oriented Programming (OOP) is used to design a class called `Node`.

A partial design of the `Node` class includes the `STRING` attribute `Content` and the `INTEGER` attribute `Pointer`, together with their getters and setters.

The class also includes a constructor, with two parameters, to set the values of these attributes.

Write pseudocode statements to declare the `Node` class, its attributes and the constructor.

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..... [5]

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(b) Complete the table by filling in the missing OOP terms and descriptions.

OOP term	description
.....	A method used to change values in private attributes in a class.
.....	An occurrence of a class during the execution of a program.
aggregation	....
inheritance	....

[4]

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