GradeMax

* 0000800000001 * DFD

Cambridge Assessment International Education

Cambridge International AS & A Level

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

* 9 7 7 1 2 1 2 8 3 4 *

COMPUTER SCIENCE **9618/32**

Paper 3 Advanced Theory **October/November 2025**

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 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 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.

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1 The composite data type, `Car`, is defined in pseudocode as:

```
TYPE Car
   DECLARE RegNumber : STRING
   DECLARE Make : STRING
   DECLARE Model : STRING
   DECLARE BodyStyle : STRING
   DECLARE Colour : STRING
   DECLARE IntoStock : DATE
   DECLARE Price : REAL
ENDTYPE
```

(a) (i) Write the **pseudocode** statement to set up a variable for one record of the composite data type, `Car`.

.....

..... [1]

(ii) Write the **pseudocode** statements to assign the following values to the variable set up in part **(a)(i)**:

- `"Blue"` to `Colour`
- `21/10/2025` to `IntoStock`

.....

.....

.....

..... [2]

(b) The data type for `BodyStyle` is changed to an enumerated type, `Body`.

(i) Write the **pseudocode** statement for the type declaration of `Body` to hold the names of the available choices:

Convertible, Hatchback, Saloon, SUV

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..... [2]

(ii) Write the new **pseudocode** statement required to update the declaration of `BodyStyle` in the definition of `Car`.

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..... [1]

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2 Numbers are stored in a computer system using binary 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 denary value of the given normalised binary floating-point number. Show your working.

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

Working .....

.....

.....

.....

.....

Denary value .....

[3]

(b) Calculate the normalised binary floating-point representation of +26.6875 in this system. Show your working.

Mantissa										Exponent					

Working .....

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[3]

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3 **(a)** HTTP and IMAP are examples of protocols used in the Application Layer of the TCP/IP protocol suite.

State the purpose of the HTTP and IMAP protocols.

HTTP .....

.....

IMAP .....

.....

[2]

(b) Describe how files are shared using the BitTorrent protocol.

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..... [4]

4 **(a)** Identify **one** benefit of circuit switching **and one** benefit of packet switching.

Circuit switching .....

.....

Packet switching .....

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[2]

(b) Identify **two** differences between circuit switching and packet switching.

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2 .....

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[2]

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5 **(a)** Describe how interrupt handling is used in low-level scheduling.

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..... [2]

(b) In process management, a process can be in one of three process states: running, ready or blocked.

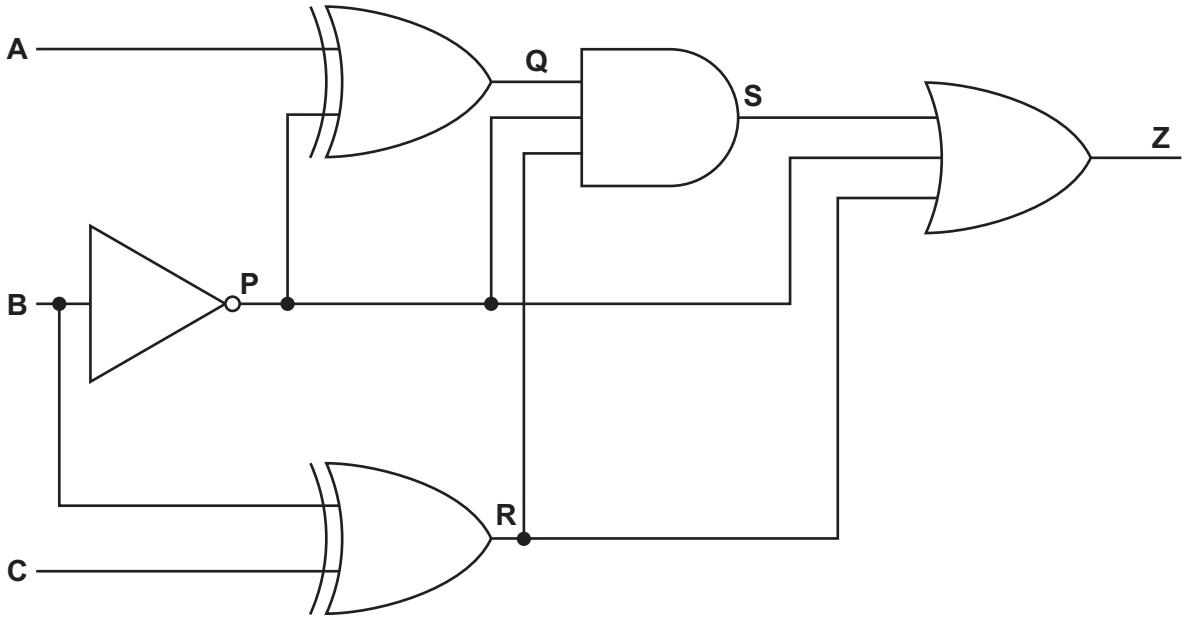
Complete the table to identify **one** reason why a process could be in each of the three states.

Process state	Reason
running	....
ready	....
blocked	....

[3]

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6 **(a)** The diagram shows a logic circuit.



Complete the truth table for the given logic circuit.
Show your working.

			Working space				
A	**B**	**C**	**P**	**Q**	**R**	**S**	**Z**
0	0	0					
0	0	1					
0	1	0					
0	1	1					
1	0	0					
1	0	1					
1	1	0					
1	1	1					

[3]

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(b) **(i)** Complete the Karnaugh map (K-map) for the Boolean expression:

$\overline{A}.\overline{B}.C + \overline{A}.B.C + A.\overline{B}.C + A.B.\overline{C}$

A \ BC	00	01	11	10
0				
1				

[2]

(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 part **b(ii)** as a simplified sum-of-products. Do **not** carry out any further simplification.

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..... [2]

7 **(a)** Asymmetric encryption is a type of cryptography.

Identify **one** other type of cryptography.

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..... [1]

(b) An organisation holds two asymmetric encryption keys, which they intend to use to receive secure transmissions.

Explain how the organisation makes use of the two keys to receive a secure transmission.

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..... [4]

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8 **(a)** State the purpose of the optimisation stage in the compilation of a program.

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..... [1]

(b) Convert this Reverse Polish Notation (RPN) back to its original infix form:

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

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..... [3]

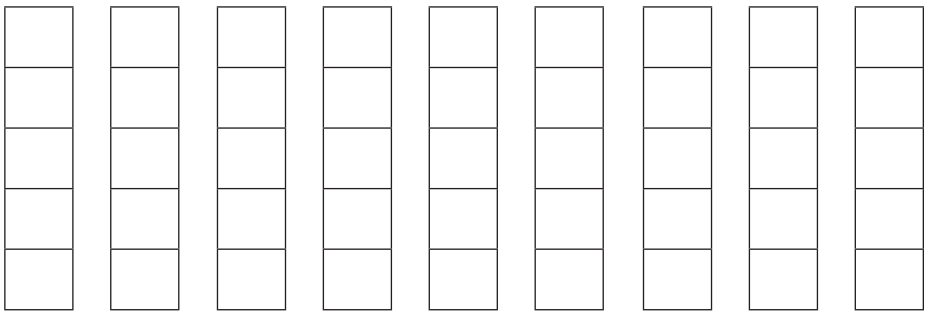
(c) The RPN expression:

`c a / b d - * b +`

is to be evaluated, where:

`a = 3`, `b = 16`, `c = 9` and `d = 6`.

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



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9 **(a)** Deep Learning is a form of Machine Learning.

(i) State **one** example where Deep Learning is used.

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..... [1]

(ii) Identify how Deep Learning can be made more effective.

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..... [1]

(b) Describe the back propagation of errors method in Machine Learning.

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..... [4]

10 An exception is an error that may cause a program to halt unexpectedly.

(a) Describe how program termination due to an exception can be avoided.

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(b) Identify **two** possible causes of exceptions.

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2 .....

..... [2]

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11 The table shows assembly language instructions for a processor that has one register, the Accumulator (ACC).

Label	Instruction		Explanation
	Opcode	**Operand**	
	LDM	#n	Load the number n to the ACC
	LDD	<address>	Load the contents of the location at the given address to ACC
	LDI	<address>	The address to be used is at the given address. Load the contents of this second address to the ACC.
	ADD	<address>	Add the contents of the given address to the ACC
	SUB	<address>	Subtract the contents of the given address from the ACC
	STO	<address>	Store the contents of the ACC at the given address
<label>:		<data>	Gives a symbolic address <label> to the memory location with the contents <data>
# denotes a denary number, e.g. #123 <label> can be used in place of <address>			

The current contents of memory are:

Address	Contents
150	26
300	86
420	150

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Write **assembly language** code, using **only** the given instruction set to:

- store the contents of location 300 as labelled variable `A`
- store the contents of location 420 as labelled variable `B`
- add the value stored in the address contained in variable `B` to the value contained in variable `A`
- store the result in variable `Answer`.

Show the initialisation and values of the variables `A`, `B` and `Answer` in the table provided.

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Label	Content

[7]

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12 **(a)** A stack has been implemented using pseudocode to store a maximum of 100 string items using the global variables in the following table:

Identifier	Data type	Description	Initialisation value
`Base`	`INTEGER`	pointer for the bottom of the stack	`0`
`Top`	`INTEGER`	pointer for the top of the stack	`-1`
`StackArray`	`STRING`	1D array to implement the stack	`[0:99]`
`Max`	`INTEGER`	maximum number of items in the stack	`100`

The value of `Top` is incremented each time a data item is added to the stack and decremented each time a data item is removed. If the stack is full, an appropriate error message is output.

(i) Complete the **pseudocode** for the procedure to add a data item onto the stack.

```
PROCEDURE Push(.....)
   IF Top < Max - 1 THEN

      Top ← .....

      ..... ← NewData
   ELSE

      OUTPUT .....
   ENDIF
ENDPROCEDURE
```

[4]

(ii) Write **pseudocode** to input a new data item and add it to the stack using `Push()`.

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(b) Explain the reasons why a stack is used when a recursive algorithm is executed.

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