



SECONDARY 4 PRELIM EXAMINATION

COMPUTING

Paper 1
Written

7155/01

16 August 2024 (Friday)

2 hours

CANDIDATE
NAME

CLASS

INDEX
NUMBER

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READ THESE INSTRUCTIONS FIRST

Do not turn over the page until you are told to do so.
Write your name, class, and index number in the spaces
provided above.
Write in dark blue or black pen.

You may use a pencil for any diagrams.

Do not use staples, paper clips, highlighters, glue or
correction fluid/tape.

Approved calculators are allowed.

Answer **all** questions.

The number of marks is given in brackets [] at the end of
each question or part question.

You should show all your working.

The total number of marks for this paper is 80.

For Examiner's Use		
1	10	
2	5	
3	4	
4	5	
5	8	
6	7	
7	5	
8	12	
9	9	
10	9	
11	6	
Total		
	/80	

1 An architecture firm, “Sigma Designs,” is upgrading its computing infrastructure to improve the efficiency and security of its operations. The firm uses software for 3D modelling and simulation and stores large amounts of client data for backup.

(a) Explain how the components of multi-core processor can benefit Sigma Designs in running their 3D modelling and simulation software.

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..... [4]

(b) Processor registers are extremely fast but small data storage spaces which are used directly by the ALU and control unit. They are physically located inside the processor.

Explain why data buses are not needed to copy data between two processor registers.

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..... [1]

- (c) Compare magnetic and optical storage media in terms of capacity and durability. Recommend the most suitable storage medium for Sigma Designs to store and access their large volumes of data quickly and securely.

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[5]

2 Daksh has just moved into a new house and wants to set up a network that includes his laptop, desktop, smartphone, smart TV, and a wireless printer. He wants to be able to print from any device and have fast, reliable internet access throughout the house.

(a) Identify **two** necessary network hardware components Daksh would need and explain the function of each component.

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..... [4]

(b) What is a Service Set Identifier?

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..... [1]

- 3 In May 2023 ¹, the Singapore Immigration and Checkpoints Authority (ICA) announced that they will progressively replace immigration counters that are manned by immigration officers with Automated Border Control System (ABCS) lanes at checkpoints from 2024 onwards. The ABCS lanes will not need to scan travellers' passports. Instead, it will use biometrics for clearance to travel into and out of Singapore.

Describe **one** positive and **one** negative social or economic impact of using the passport-free, biometric ABCS lanes instead of counters manned by immigration officers who manually check travellers' passports.

Positive

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Negative

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[4]

¹ Taken from The Straits Times article titled "Passport-free clearance to be rolled out at all Singapore checkpoints from 2024" (6 May 2023). Source: <https://www.straitstimes.com/singapore/passport-less-clearance-to-be-rolled-out-at-all-checkpoints-from-2024>

4 The table below contains statements about software licenses.

Tick (✓) **one** or **more** boxes in each row to indicate if the statement is true for free and open-source (FOSS) software, freeware and shareware.

Statement	FOSS software	Freeware	Shareware
May be legal to copy and distribute			
Considered a limited version of proprietary software			
Source code is kept secret			
May be legally modified			
Copyrighted			

[5]

- 5 Kaden has obtained the Ultraviolet (UV) Index readings from the school field. The readings have been taken hourly for a week, with the first reading at 7am and the last reading at 7pm, and recorded in a text file. The UV Index values are whole numbers ranging from 0 to 10 inclusive.

Kaden writes a program to analyse the readings to find out the number of days that the average UV Index reading is more than 7.

- (a) Specify one input to the program and state one requirement for the input to be valid.

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..... [2]

- (b) The problem can be decomposed into smaller and more manageable parts before Kaden writes the program.

Identify **two** parts for this program.

1

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2

..... [2]

- (c) Kaden saves the data onto a memory card. He also uploads the data to a cloud storage service and shares it with his project groupmates.

Describe two kinds of human actions that may threaten the integrity or availability of the data. For each way, describe one measure Kaden can take to prevent it. Each measure must be different.

Human Action 1:

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Preventive Measure 1:

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Human Action 2:

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Preventive Measure 2:

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[4]

- 6 (a)** The IPv4 version of Internet Protocol (IP) addresses is made up of 4 bytes, usually shown as a sequence of 4 denary values, one for each byte of the address.

An example of an IPv4 address is 179.101.1.1.

- (i)** Convert the first byte of the IPv4 address to hexadecimal.

..... [1]

- (ii)** Convert the second byte of the IPv4 address to a 1-byte binary number.

..... [1]

- (b)** State one common use of the hexadecimal number system.

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..... [1]

- (c)** Describe how the hexadecimal number 2FA is converted to denary. Give the denary value in your answer.

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..... [4]

- 7 A home baker uses a spreadsheet to record her monthly sales and profit for the cakes and cookies that she sells.

An example from the spreadsheet is shown:

	A	B	C	D	E	F	G	H	I	J	K
1	No.	Item	Sales	Cost Price	Selling Price	GST Payable	Profit per piece	Total Profit		Prevailing GST	9%
2	1	Chocolate Chip Cookie	73	\$0.50	\$1.00	\$0.08	\$0.42	\$30.47			
3	2	Oatmeal Cookie	44	\$0.60	\$1.00	\$0.08	\$0.32	\$13.97			
4	3	Peanut Butter Cookie	81	\$0.45	\$1.00	\$0.08	\$0.47	\$37.86			
5	4	Pandan Cake	20	\$15.00	\$20.00	\$1.65	\$3.35	\$66.97			
6	5	Unicorn Cake	34	\$25.00	\$40.00	\$3.30	\$11.70	\$397.71			
7	6	Kueh Lapis	19	\$27.00	\$45.00	\$3.72	\$14.28	\$271.40			
8	7	Strawberry Shortcake	0	\$20.00	\$35.00	\$2.89	\$12.11	\$0.00			
9											
10							Total profit from all sales	\$818.38			
11							Target total profit	\$1,500.00			

- (a) Cell H10 displays the total profit from the sales from items 1 to 7, rounded to 2 decimal places.

Describe the formula that will be used in H10

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[2]

- (b) The formulas in cells F2 to F8 use the Prevailing GST in cell K1.

Identify the type of cell referencing that allows the value in K1 to be used in each formula from F2 to F8, without re-entering the cell reference each time.

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[1]

- (c) The baker has a target of a total profit of \$1500 from all sales, as shown in cell H11.

Leaving all other values the same, describe how she can use the Goal Seek tool to adjust the Total Profit required from the sale of Strawberry Shortcakes in order to meet her target total profit.

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[2]

- 8 School Stationery Trading Shop (SSTS) is holding a sale for a certain model of pens. The pens are sold at \$1.50 each for students and \$1.80 each for non-students. If more than 3 pens are bought, the customer will receive a 10% discount. If more than 3 pens are bought and at least one of them is a green pen, the customer will receive a 20% discount. A customer will not be able to get both discounts on a single purchase.

The following code takes input of the number of green and other coloured pens that the customer is buying, and whether the customer is a student or not. The code then calculates and outputs the total price.

```
01 green = int(input())
02 other = int(input())
03 student = input()
04 if student == true:
05     total = 1.5 * (green + other)
06 else:
07     total = 1.8 * (green + other)
08 if green + other > 3 and green > 1:
09     total = 0.8 * total
10 if green + other > 3:
11     total = 0.9 * total
12 print total
```

There are several errors in the program code.

- (a) Identify the line numbers of two logic errors and give the corrected lines.

Error 1

Corrected line

Error 2

Corrected line [2]

- (b) Identify the line numbers of two syntax errors and give the corrected lines.

Error 1

Corrected line

Error 2

Corrected line [2]

(c) Name the data type of the variable `total`.

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[1]

(d) (i) Name one data validation technique that can be used for the variable `green` and describe what it should check for in this context.

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[2]

(ii) Write **program code** to implement the validation check you described in part (i). The **code** should repeatedly ask for input until it is valid.

[3]

(e) (i) The program code does not have any constants.

Suggest one way to modify the program code such that it uses constants in an appropriate way.

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[1]

(ii) Explain one advantage of assigning fixed values in a program as constants.

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[1]

- 9 A function is written in **program code**.

The function `func` takes two parameters `x` and `y` and returns an integer.

```
def func(x, y)
    if x == 0:
        return y
    return func(y mod x, x)
```

The main program is:

```
a = input("Enter a: ")
b = input("Enter b: ")
print(func(a, b))
```

- (a) Complete the trace table for the algorithm when 133820 and 245 are input.

Main program			func()		
a	b	Output	x	y	Value returned

[4]

- (b) Identify the purpose of the algorithm.

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..... [1]

- (c) The function `func (x, y)` is known as a recursive function. Explain how `func (x, y)` processes its arguments to produce the final return value.

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..... [2]

- (d) (i) Name the stage of developing a program where program developers may **draw a flowchart**.

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..... [1]

- (ii) Describe one other task besides **drawing a flowchart** that program developers may perform at this stage.

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..... [1]

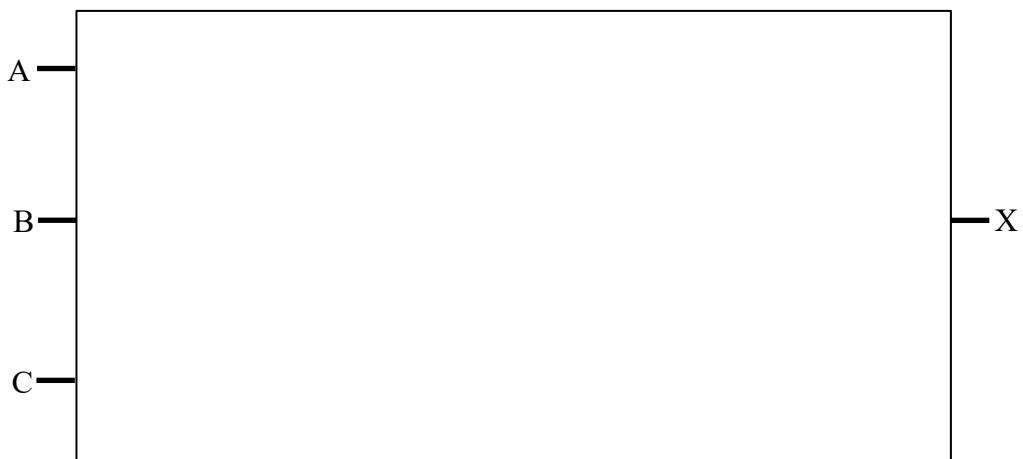
10 (a) Complete the truth table for the following Boolean expression.

$$X = \overline{(A + \overline{B} \cdot C)} + B$$

A	B	C	Working Space	X
0	0	0		
0	0	1		
0	1	0		
0	1	1		
1	0	0		
1	0	1		
1	1	0		
1	1	1		

[4]

(b) Draw the logic circuit for the expression in part (a). Do not simplify the expression.



[4]

(c) Using the truth table from part (a), simplify the Boolean expression such that it only uses two distinct types of logic gates.

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[1]

- 11 Parity check is an error-checking technique which uses a parity bit to detect errors. The parity bit is an additional bit which is either appended or prepended to a string of binary data for transmission.

Write **program code** to:

- take input of the type of parity check system to be used (either Odd or Even)
- take input of a string of bits
- determine and output whether the string is valid or invalid according to the parity system
- repeatedly take input of strings of bits and output their validity until the user indicates that the algorithm should stop.

[6]

--- END OF PAPER ---