FORM TP 2022203

TEST CODE 02115020

MAY/JUNE 2022

CARIBBEAN EXAMINATIONS COUNCIL

CARIBBEAN ADVANCED PROFICIENCY EXAMINATION®

COMPUTER SCIENCE

FUNDAMENTALS OF COMPUTER SCIENCE

UNIT 1 – Paper 02

2 hours 30 minutes

READ THE FOLLOWING INSTRUCTIONS CAREFULLY.

1. This paper consists of SIX questions. Answer ALL questions.
2. Write your answers in the spaces provided in this booklet.
3. Do NOT write in the margins.
4. If you need to rewrite any answer and there is not enough space to do so on the original page, you must use the extra lined page(s) provided at the back of this booklet. **Remember to draw a line through your original answer.**
5. **If you use the extra page(s) you MUST write the question number clearly in the box provided at the top of the extra page(s) and, where relevant, include the question part beside the answer.**

DO NOT TURN THIS PAGE UNTIL YOU ARE TOLD TO DO SO.

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SECTION A

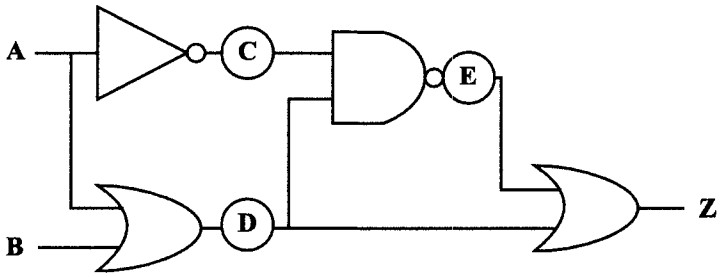
COMPUTER ARCHITECTURE

Answer BOTH questions.

1. (a) Using logic gates, draw a clearly labelled diagram of a SR flip-flop.

[4 marks]

(b) Construct the truth table for the following circuit which is a combination of basic logic gates.



[6 marks]

(c) Consider the following hexadecimal number.

Hexadecimal number: A9

(i) Convert the hexadecimal number stated above to binary.

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[2 marks]

(ii) Assuming that your answer in (c) (i) is a two's complement binary number, convert it to a decimal number.

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[3 marks]

Total 15 marks

2. (a) (i) Define the term 'cache memory'.

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[2 marks]

(ii) Explain how cache memory increases the efficiency of data retrieval in the CPU.

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[3 marks]

(b) (i) Name TWO components of the CPU, other than registers.

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[2 marks]

(ii) State the function of EACH of the components named in (b) (i).

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[2 marks]

(c) Briefly describe a scenario in which EACH of the following types of computers can be used.

(i) Supercomputer

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[2 marks]

(ii) Server

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[2 marks]

(iii) Mobile device

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[2 marks]

Total 15 marks

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SECTION B

PROBLEM-SOLVING WITH COMPUTERS

Answer BOTH questions.

3. (a) List the THREE properties of a well-designed algorithm.

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[3 marks]

(b) Construct a flowchart to represent the following algorithm.

```
start
print 'Enter A:'
read A
total = 1
while A > –1 do
    A = 2 × A;
    if A < 20 then
        A = A – 1
    else A = A + 1
    endif
    total = total + A
    print 'Enter A:'
    read A
end while
print total
stop
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[12 marks]

Total 15 marks

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4. (a) Briefly describe any THREE stages in the software development cycle.

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[6 marks]

(b) Define the following control constructs and give ONE example of EACH.

(i) Selection

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[2 marks]

(ii) Iteration

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[2 marks]

(c) Read the algorithm below and answer the questions that follow.

```
read z
sum = 1
while z < 8 do
        sum = sum * (z–1)
        read z
endwhile
print 'SUM =',sum
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(i) State the type of iteration illustrated in the algorithm above.

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[1 mark]

(ii) State how the loop in the algorithm above is expected to terminate.

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[1 mark]

(iii) Using a trace table, show how the output of the algorithm above would print given the line of input data below.

5 3 2 6 12 4

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[3 marks]

Total 15 marks

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SECTION C

PROGRAMMING

Answer BOTH questions.

5. (a) Briefly describe ANY TWO stages of the program translation process.

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[4 marks]

(b) Explain TWO ways in which good programming style can be maintained when writing code.

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[4 marks]

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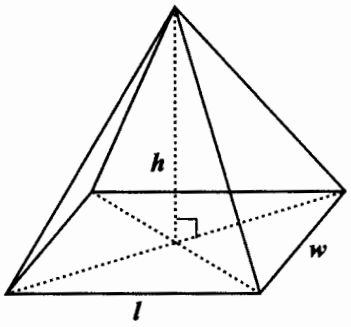
(c) The formula for finding the volume of a rectangular base pyramid is given below.



Volume = (1/3) × Area of Base × Height

Area of Base = Base length × Base width
$= l \times w$

Write a C function, pyramidVolume, that accepts three parameters, baseLength (l), baseWidth (w) and height (h), then calculates and returns the volume of a rectangular base pyramid, such as the one shown in the diagram above.

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6. (a) Differentiate between 'declarative' and 'imperative' programming languages.

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[2 marks]

(b) A vendor uses a C application to store data about the vegetables that he sells. Each vegatable has an ID (integer), a cost price (floating point), a selling price (floating point) and a quantity in stock (integer).

(i) Write a declaration for a C struct *vegeRec* that can store the record for a given vegetable.

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[2 marks]

(ii) Declare TWO variables, *carrot* and *peas*, that have their record structure declared in (c) (i).

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[1 mark]

(iii) Write C code to input data into the *carrot* struct in (c) (ii). You can use any value for ID, cost price, selling price and quantity in stock.

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[2 marks]

(iv) Assume that two *vegeRec* structs, *tomato* and *beans*, are already loaded with data. Write C code to exchange the cost price values of *tomato* and *beans*.

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[3 marks]

(c) Write a C function, **total**, which accepts a ten-value integer array as a parameter, **number [10]**, and returns a count of the numbers in the array that are LESS THAN 20.

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[5 marks]

Total 15 marks

END OF TEST

IF YOU FINISH BEFORE TIME IS CALLED, CHECK YOUR WORK ON THIS TEST.