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CARIBBEAN EXAMINATIONS COUNCIL

SECONDARY EDUCATION CERTIFICATE EXAMINATION

INFORMATION TECHNOLOGY

Paper 02 – General Proficiency

INFORMATION PROCESSING PROGRAMMING

2 hours

15 MAY 2008 (a.m.)

INSTRUCTIONS TO CANDIDATES

1. **Number EACH answer correctly in your answer booklet.**
2. **Begin EACH answer on a new page.**
3. **This paper consists of TWO sections, Section I and Section II.**
4. **Candidates must attempt the first question in EACH section and choose TWO other questions from EACH section.**

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SECTION I

INFORMATION PROCESSING

Answer Question 1 and any TWO other questions from this section.

1. (a) State TWO advantages and TWO disadvantages of information processing. **(4 marks)**

(b) Describe the use of control systems that use the following sensors. Be sure to give an example in EACH case:

(i) Temperature sensor **(2 marks)**

(ii) Pressure pad sensor **(2 marks)**

(iii) Light sensor **(2 marks)**

(c) Give TWO reasons why businesses need to create or modify an information system. **(2 marks)**

(d) Explain the difference between quantitative and qualitative data collection methods. **(2 marks)**

(e) Consider the following situations (i) – (iii). For EACH situation:

- State whether the situation illustrates quantitative or qualitative data collection
- Give an example of a method that would BEST suit the situation, and
- Explain what data can be gathered

(i) To determine the taste of a new burger in a fast food outlet **(3 marks)**

(ii) To follow a trend in a story which was first published ten years ago **(3 marks)**

(iii) 1200 students give views on how a course was taught **(3 marks)**

(f) With regard to maintenance, review and evaluation in the systems development life cycle

(i) State where they are placed in the phases of the life cycle **(1 mark)**

(ii) Explain their importance in the system. **(3 marks)**

Total 27 marks

2. (a) Explain the purpose and advantage of keeping a data dictionary. **(2 marks)**

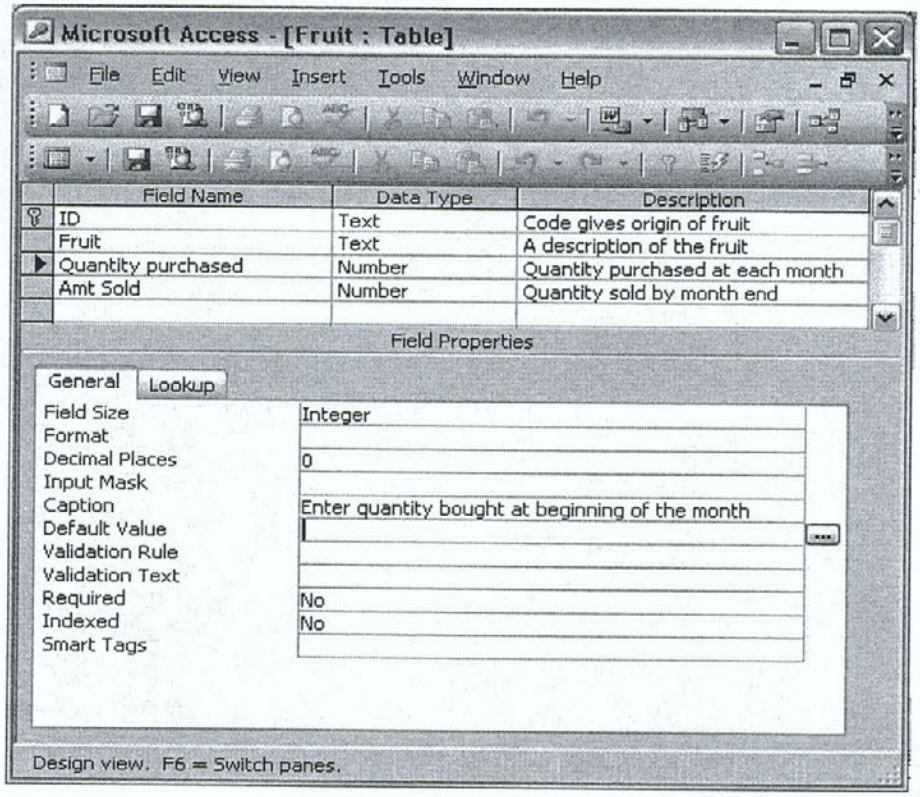
(b) Use Figure 1 to answer the following questions.

(i) What is the name of the table? **(1 mark)**

(ii) What is the name of the primary key field? **(1 mark)**

(iii) Explain how many details are provided on the Quantity purchased field, and describe any THREE details. **(4 marks)**

Figure 1



(c) Draw and explain TWO of the symbols used in EACH of the following:

(i) A data flow diagram **(3 marks)**

(ii) An entity-relationship diagram **(3 marks)**

(d) Given the following rules, create a decision table for the procedure:

Once a student is registered to take the Information Technology (IT) exam in June, then the School-Based Assessment (SBA) must be completed. If the student is re-sitting the exam in January, then the marks for the SBA are used, otherwise the student takes the SBA Alternative paper.

(10 marks)

Total 24 marks

3. (a) Marlon sells fruit and vegetables every weekend, and keeps track of his produce and sales, as shown below:

File 1

Item No.	Description	Quantity on hand	Quantity on order
101	Bananas	45	12
601	Grapes	25	5
801	Melons	10	5
901	Plantains	60	10
1001	Potatoes	80	40

He has received some produce as shown below:

File 2

No.	Description	Quantity received
601	Grapes	0
701	Lemons	10
901	Plantains	10

(i) Which of the above files is the Master File and which is the Transaction File. **(2 marks)**

(ii) Copy the headings from File 1 and complete the table to show the updated quantities. **(4 marks)**

(iii) What is the name given to this third file containing the updated quantities? **(1 mark)**

(iv) Explain whether these updates illustrate a batch, interactive or on-line process. **(2 marks)**

(v) Explain ONE disadvantage of your choice in part (iv) over the other two. **(1 mark)**

(b) (i) Explain why you would want to validate your data as well as verify it. **(2 marks)**

(ii) Explain and give an example for EACH, to illustrate when a range check and a data type check is appropriate. **(4 marks)**

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(c) Given 1.963×10^4, identify the:

(i) Mantissa or argument **(1 mark)**

(ii) The base or radix **(1 mark)**

(iii) The exponent **(1 mark)**

(iv) The notation used **(1 mark)**

(d) Represent the value 1263 as a floating point number. **(2 marks)**

(e) Explain TWO types of errors that can occur when representing numbers in a computer system. **(2 marks)**

Total 24 marks

4. (a) Consider the following illustration of a supermarket, where items are placed in aisles:

Aisle	Locator	Item#
1	15	3 – Bread 5 – Cake 10 – Doughnuts 13 – Éclairs
2	25	17 – Fish 20 – Chicken 22 – Turkey 23 – Lamb
3	35	26 – Apples 27 – Oranges 30 – Peaches 32 – Tangerines

(i) State the paths taken to locate the Turkey. **(3 marks)**

(ii) Suppose you were looking for Item #21 – Beef. State the aisle number that you would choose and the item that would indicate whether it is there or not. **(2 marks)**

(iii) Explain the difference between direct, sequential and index sequential organization. **(3 marks)**

(iv) Identify the type of file organization in the above illustration, and state the name given to the Aisle column. **(2 marks)**

(b) The following information represents instructions in a certain computer:

Location	Function	Address
101	LOA	1000
102	ADD	1001
103	DUP	1101
104	SUB	1101
105	DUP	1101
106	END	

The computer has the following instruction code:

LOA X	load the contents of address X into the accumulator
ADD X	add the contents of address X to the contents of the accumulator
SUB X	subtract the contents of address X from the contents in the accumulator, and store the result in the accumulator
DUP X	copy the contents of the accumulator to the storage area X
END	stops execution of the program

(i) Name the TWO parts of an instruction. **(2 marks)**

(ii) What is another name for the accumulator and explain the purpose of the accumulator? **(2 marks)**

(iii) Trace the program as the instructions are executed when address 1000 contains the number 12, address 1001 contains the number 1 and address 1101 contains the number 10. **(6 marks)**

(iv) Name and explain TWO other instructions similar to the instruction code above, that can be used in a program. **(4 marks)**

Total 24 marks

SECTION II

PROGRAMMING

Answer Question 5 and any TWO other questions in this section.

5. The tiny island of SunSet has taken strict measures to ensure that pollution from a chemical plant does not adversely affect its citizens. Officials determine that the following fines will be applied to this plant.

	Pollution Level(%)	Status	Fine
1	0 - 25	Acceptable	None
2	26 - 50	Unsatisfactory	$10,000.00
3	>50	Hazardous	$25,000.00

When pollution rises above 50% the city will shut down the plant for 3 months while changes are made. If the plant is closed the company loses profits totaling $375,000.00.

A program that will determine the total expenses (fines and profits lost) that the company will suffer in the event that pollution rises above the permitted level is to be written using the following instructions:

(a) Declare a variable to hold the **pollution level** as a decimal value. **(1 mark)**

(b) Declare a variable to hold the value of the **Fine** as a decimal value. **(1 mark)**

(c) Declare a variable to hold the loss in profits as a decimal value. **(1 mark)**

(d) Declare a variable to hold the total expenses (sum of fine and profits lost) as a decimal value. **(1 mark)**

(e) Assign the value 375,000.00 to the variable declared to hold profits lost. **(1 mark)**

(f) Prompt the user for the pollution level. **(1 mark)**

(g) Accept the value for the pollution level. **(1 mark)**

(h) If the pollution level is unsatisfactory,

(i) assign the value 10,000.00 to the variable declared to hold the fine and

(ii) print the statement "The fine is $10,000.00". **(4 marks)**

(i) If the pollution level is hazardous,

(i) assign the value 25,000.00 to the variable declared to hold the fine

(ii) calculate the total expenses by combining the fine with the loss of profits and assign that value to the variable declared to hold the total expense.

(iii) Print EACH of the following statements on a different line.

a) "The fine is $25,000.00"

b) "The Profits lost is $375,000.00

c) "The total expenses are: (insert the variable for total expenses here)"

(6 marks)

(j) In 1997 the plant had three months of unsatisfactory levels of pollution and was charged the declared fee (for unsatisfactory status) each of the three months. At the end of that period, the company was forced to reapply for licensing which cost them an additional fee of $500.00 for each violation encountered by inspectors. Use the instructions below to rewrite the portion of your program code that deals with unsatisfactory pollution levels. You may assume all new variables have been previously declared.

(i) Write a line of code where the monthly fine is multiplied by the number of months (NumMonths) and stored as the total fee to be charged (TotFine).

(2 marks)

(ii) Write a line of code that calculates the total charge for violations (TotCharges) by multiplying the number of charges (NumCharges) by the charge per violation (VioCharge). **(2 marks)**

(iii) Write a line of code that adds the answer total fee (TotFine) to the total Charges (TotCharges) and stores the answer as TotExpenses (total expenses).

(2 marks)

(iv) If there were THREE violations found, what was the total amount of money the company was forced to pay out at the end of the three months in 1997?

(4 marks)

Total 27 marks

6. Use a table such as the one shown to trace the following program segment. The variables score, totalscore, amtscore, are all integer values while variable avgscore holds a decimal value.

(a) Use the numbers 85, 76, 69, 95 as your score values.

amtscore	score	totalscore	avgscore
1	55	55	
2	45	100	
3			
:			

Variables

```
        int score,totalscore,amtscore,avgscore
        totalscore=0; avgscore=0; amtscore=1;
main()
{                                                    (program begins here)
        if (amtscore <=4)
        {                                            (IF portion begins here)
        output "Enter the score:";
        input score;
        totalscore = totalscore + score
        amtscore = amtscore + 1
        }                                            (IF portion ends here)
        avgscore = totalscore / amtscore;
}                                                    (program ends here)
```

(13 marks)

(b) Calculate the output when the following program segment is executed (k%n returns the remainder from dividing k by n). **Remember** operator precedence.

```
i = 5
j = 6
k = 7
n = 3;

print (i + j * k – k %n);                    ( 1 mark )
print (i + j * k – k / n)                    ( 1 mark )
```

(c) Explain the purpose of the lines 1, 3, 5 and 7 of the following program code. The code seeks the GREATEST common divisor for two integers. (Note != means not equal to)

```
1    x :=4;
2    y ;=24;
3    WHILE x !=y DO
4            IF x > y THEN
5                    x := x–y
6            ELSE
7                    y := y–x
8            ENDIF
9    END DO                                  ( 4 marks)
```

(d) Use a table to show the changes in x and y if the programs start with x = 96 and y = 256. **(5 marks)**

Total 24 marks

7. Consider the following algorithm:

(i) Prompt user for total tuition value, number of children attending high school and the total income for parents

(ii) Accept values (if parents earn more than $25,000.00 per year, discount is 0%, otherwise discount is 10%. For every sibling in high school 5% discount even if parents earn more than $25,000.00)

(iii) Calculate discount

(iv) Calculate tuition payable (Total tuition minus total discount)

(v) Print Tuition payable

(a) Draw a flowchart for this algorithm. Be sure to use appropriate symbols and labelling. **(11 marks)**

(b) Write a program using pseudocode to correspond to this algorithm. **(13 marks)**

Total 24 marks

8. I am sorting a list of values using a well known algorithm called Selection Sort. I want to change the list from what is in Figure 2 to what is shown in Figure 3. There is an error in the algorithm.

(a) Find and fix the error. **(2 marks)**

(b) Run the algorithm. Show at EACH step, the values of i, min, j, values [j], values[min], values[1], and temp. **(22 marks)**

Figure 2

position	0	1	2	3	4	5
value	90	15	84	23	76	12

Figure 3

position	0	1	2	3	4	5
value	12	15	23	76	84	90

Note: values[i] means the number in position "i" in the values list. For example, using the original list, when i = 5, values[i] = 12. The symbol "{" marks the beginning of a unit of code while the symbol "}" marks the end of a unit of code.

```
1   int i, j;
2   int min, temp;
3   for (i = 0 to i <5)              "This means i can take on values between 0 and 9"
4   {
5   min = i;
6   for (j = i+1; j<6)               "This means j can take on values between 0 and 10"
7     {
8       if (values[j] < values [min])
9         { min = j;        }
10      j = j + 1;
11  }
12  temp = values [i];
13  values[i] = values[min];
14  values[min] = temp;
15  i = j + 1;
16  }
```

Total 24 marks

END OF TEST