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SECONDARY EDUCATION CERTIFICATE EXAMINATION

INFORMATION TECHNOLOGY

Paper 02 – General Proficiency

INFORMATION PROCESSING AND PROGRAMMING

2 hours

17 MAY 2007 (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) Consider the following which illustrate data and information:

1 32-26-38
2 36-36-38
3 34-26-36
4 38-40-38

Illustration 1

Four sets of data were retrieved. The last set showed a peek of 40 cars during midday time period.

Illustration 2

(i) State which of the illustrations represents data and which one represents information. **(2 marks)**

(ii) Describe the differences between data and information from the above illustrations. **(2 marks)**

(iii) Explain how the data is formatted. **(2 marks)**

(iv) Give another short example of how the data can be interpreted. **(1 mark)**

(b) Describe an application for EACH of the following sensors which are used to automate information processing functions:

(i) Analog temperature sensor **(2 marks)**

(ii) Light sensor **(2 marks)**

(iii) Pressure sensor **(2 marks)**

(c) Sketch an analog signal and a digital signal. **(2 marks)**

(d) State which of the above signals can determine

(i) whether a button is pressed **(1 mark)**

(ii) how hard or soft the button is pressed. **(1 mark)**

(e) Data logging is the term given when a computer is used to automatically record data as it is produced.

(i) Give TWO advantages of using data logging. **(2 marks)**

(ii) Describe ONE situation of a data logging application where the computer and user are located some distance away from the sensors. **(2 marks)**

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(f) A data logging device is used to record information about the current traffic flow at a road junction. The junction has crossroads with a set of traffic lights in each direction, as shown below:

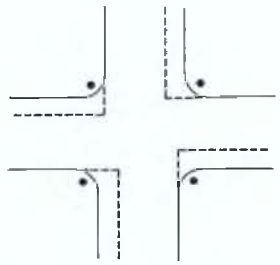


Figure 1

(i) Explain, giving TWO examples, what basic data can be logged at the crossroads in Figure 1. **(2 marks)**

(ii) You have temperature, pressure, button and light sensors available. Suggest, with reasons, ONE sensor that would be appropriate to log this data. **(2 marks)**

(iii) The logging will take place over a period of two weeks. Give TWO reasons why it would be difficult to gain an accurate impression of the traffic flow at the junction in a shorter time period. **(2 marks)**

Total 27 marks

2. (a) For EACH of the following, describe TWO reasons for

(i) creating or modifying an information system **(4 marks)**

(ii) analyzing actual documents for data collection **(4 marks)**

(iii) using the direct conversion approach **(4 marks)**

(b) Consider the following paragraph:

When you tackle a project you should follow the five stages in the systems (1) _____ life cycle, starting with the (2) _____ and ending with an (3) _____ of the work that you have done. Wherever possible, you should complete one stage before going on to the next. You will also be expected to produce a (4) _____ of how the project should be produced before it is (5) _____. After all, you may have (6) _____ the system and convinced yourself that it works, but how are you going to convince the person assessing your work?

Copy the numbers 1 to 6 in your examination booklet and next to each number write one of the following terms which is suitable to complete the paragraph: **tested, evaluation, analysis, development, implemented** and **design**. **(6 marks)**

(c) Describe TWO responsibilities of EACH of the following personnel in the systems development life cycle:

(i) Systems Analyst **(2 marks)**

(ii) Project Leader **(2 marks)**

(iii) Project Team **(2 marks)**

Total 24 marks

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3. (a) A supermarket uses a Point of Sale (POS) terminal to keep track of the goods that it has in stock and to produce bills for customers. Whenever an item is sold, the product code of the item is read by a barcode scanner. The price and name of the product is checked in the supermarket's stock database and this information is printed on the customer's receipt. It also updates the product's record in the stock file to indicate that the product has been sold.

(i) Draw a data flow diagram, using the information given in the scenario above. **(8 marks)**

(ii) Explain whether this type of processing mode is batch, interactive, on-line or real-time. **(2 marks)**

(b) Draw a decision table based on the following scenario on orders placed by a supermarket:

If orders of 5000 units or more are placed, and there is a credit facility in place, then the supermarket is given 90 days to pay. If, however, there is no credit facility in place, then the supermarket must pay 25% of the cost. If the order is less than 5000 units, and there is a credit facility, then it is given 30 days to pay. The supermarket must pay full cost otherwise. **(8 marks)**

(c) Given the number 6.312×10^4 in standard form

(i) identify the mantissa **(1 mark)**

(ii) identify the exponent **(1 mark)**

(iii) identify the base or radix **(1 mark)**

(iv) write the number in non-standard form. **(1 mark)**

(d) Determine if the result of 0011 + 1100 can be stored as a four-bit binary number. **(2 marks)**

Total 24 marks

4. (a) Consider the following membership form:

Membership Form

Membership #:	20221
Name:	Terri Hall
Gender:	Male
Phone:	222 2345
Date of Birth:	05/12/05

(i) Explain the purpose of designing a good data capture form. **(2 marks)**

(ii) This form has been poorly designed. Describe TWO areas on the form that can be confusing. **(4 marks)**

(iii) State TWO codes that can help make the form easier to understand. **(2 marks)**

(iv) Name and explain TWO types of checks that can be implemented in the data entry program. **(4 marks)**

(v) Give an example of the data coded from the membership form that is ready for data entry. **(2 marks)**

(b) Consider the following definitions:

MOV A, B – Put the value of B into A
SUB A, B – Subtract the value of B from the value in A, and put the result in A
ADD A, B – Add the value of A to the value in B

Give the result of SUM and AMT after the following segment of code is executed, if SUM contains the initial value of 15 and AMT contains 5:

```
MOV D, SUM
MOV F, AMT
SUB D, F
ADD D, 50
MOV SUM, D
```

(6 marks)

(c) (i) Explain why a program counter is important in executing a program. **(2 marks)**

(ii) Explain what the program counter contains. **(1 mark)**

(iii) State the official name of a program counter. **(1 mark)**

Total 24 marks

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SECTION II

PROGRAMMING

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

5. Use the following algorithm to write a program that allows your user to input any number of integers until zero is entered. At that point the program will end. Your program will produce the SUM of the values, the AVERAGE of the values and number of values input: the COUNT.

You MUST use a programming language. **(4 marks)**

(a) Declare variables for SUM, AVG and COUNT. **(3 marks)**

(b) Set SUM and COUNT equal to zero (0). **(2 marks)**

(c) Prompt the user to enter the first number. **(1 mark)**

(d) Read the value. **(1 mark)**

(e) Check to see if this value is zero. If it is, continue from step ***(k)*** otherwise continue from step ***(f)***. **(2 marks)**

(f) Add this first value to the ***Sum*** and make this new value the new ***Sum***. **(2 marks)**

(g) Add one to the ***Count*** and make this new value the ***Count*** (increment the count). **(2 marks)**

(h) Prompt the user to input another number. **(1 mark)**

(i) Read the value. **(1 mark)**

(j) Repeat from steps (e) to (i). **(2 marks)**

(k) Compute the average. **(2 marks)**

(l) Print the statement: "The Sum of the values entered is" and include the value for SUM. **(2 marks)**

(m) Print the statement: "The Average of the values entered is" and include the value for **AVG**. **(1 mark)**

(n) Print the statement: You entered **COUNT** values. **(1 mark)**

(o) Stop the program.

Total 27 marks

6. Twin brothers Robert and Rupert are trying to figure out who has the better chance of getting a Science award offered by their High School. Use a structure/method similiar to a trace table to determine which boy gets the award.

Robert T J Jones		
Course	Credits	Grade
Biology	3	B+
Chemistry	3	C
Physics	4	B

Rupert J T Jones		
Course	Credits	Grade
Biology	3	A⁻
Chemistry	3	A
Physics	4	C

Letter Grade Value	
Letter Grade	Value per Credit
A	4.00
A–	3.75
B+	3.50
B	3.00
C+	2.50
C	2.00

For each of the statements below, **write out the changes** that will be made to the variables **GPA, CRD,** ***RobGPA*** and ***RupGPA***. Show all calculations made and all print statements.

Set the Grade Point Average (GPA) to be zero (0) at the beginning.
Set Credits (CRD) to be zero (0) at the beginning.

If we start with Robert:

(a) Find the Letter Grade for the first course (Biology). **(1 mark)**

(b) Add the credit (associated with the course) to the value in ***CRD***. **(1 mark)**

(c) Multiply the **Credits** for this course in part (a) with the **Value per Credits.** **(1 mark)**

(d) Add this result from part (c) to the ***GPA***. **(1 mark)**

(e) Go to the next course.

(f) Repeat steps ***a*** to ***d*** for the second and third course. **(4 marks)**

(g) When the first person (Robert) is finished, divide the value in the ***GPA*** variable by the value in the ***CRD*** variable and store the results as ***RobGPA***. **(2 marks)**

(h) Reset the values in ***GPA*** and ***CRD*** to zero. **(1 mark)**

(i) Move on to the next person (Rupert) and do steps ***(a)*** to ***(f)*** once more. **(8 marks)**

(j) When this person (Rupert) is finished, divide the value in the GPA variable by the value in the CRD variable. Store the results as ***RupGPA***. **(2 marks)**

(k) Compare ***RobGPA*** with ***RupGPA***. The highest value identifies the winner of the award. **(1 mark)**

(l) Print "The award goes to:" followed by the name of the winner. **(2 marks)**

Total 24 marks

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7. (a) In one computer language, the notation ***a***++ means that a user would add the value 1 to the value ***a*** *after* using it in an operation. The notation ++***a*** means that a user would add the value 1 to the value ***a*** *before* using it in an operation.

(i) Use the trace table to show the values of ***a*** and ***x***.

```
x = 3, a = 1;
while a < 4
        { x = x * a++;
          x = x – a;
        }
```

(4 marks)

(ii) Use the trace table to show the value of ***a*** and ***x***.

```
x = 3, a = 1;
while a < 4
        { x = x * ++a;
          x = x – a;
        }
```

(4 marks)

(b) A teacher is writing a piece of program code that will help to determine the letter grade that a student will receive based on the marks earned. A student who earns a 90 and above will receive an "A". A student who earns between 80 and 89 will receive a "B". 70 to 79 is a "C" and 60 to 69 is a "D". Below 60 is an "F". The code below is an incomplete set of nested IF statements. Some of the statements are also incorrect. Correct and complete the code so that the appropriate correct responses will be provided.

```
If mark > 89
        Lettergrade = "A"
Else
        If mark > 79
                Lettergrade = "B+"
        Else
                If mark > 60
                        Lettergrade = "C"
                Else
                        mark >58
                        Lettergrade =
```

(8 marks)

(c) The following statements use the operator **&&** to mean a logical ***AND***, and the operator || to mean a logical ***OR*** combining elements of a programming statement. If ***LegalAge*** = 17 and ***DriverAge*** = 24, what would be the response returned after evaluating the two statements below (True or False)?

(i) (LegalAge>16) && (DriverAge<LegalAge) **(2 marks)**

(ii) (LegalAge<21) || (DriverAge = 21) **(1 mark)**

(iii) I wish to employ a driver who is of legal age but not older than 21. Write a statement using the operators and variables provided above to represent my wishes. **(3 marks)**

(d) Two students are having an argument about the difference between an interpreter and a compiler for a computer program. Provide the students with a definition of each word so that it is clear what the difference is. **(2 marks)**

Total 24 marks

8. The following algorithm determines if a year is a leap year or not:

A leap year is divisible by 4 (no remainder). There is one exception. If the year is divisible by 100 then it is also divisible by 400. The statement, "This is a Leap Year" is printed if a leap year is input, otherwise "This is NOT a Leap Year" is printed.

(a) Draw a flowchart to represent this algorithm. Be sure to use appropriate symbols. **(8 marks)**

(b) Write a segment of programming code in a language of your choice to represent the algorithm. **(16 marks)**

Total 24 marks

END OF TEST