0795/2/2024
CSC A/L

SOUTH WEST REGIONAL MOCK EXAMINATION
GENERAL EDUCATION

THE TEACHERS' RESOURCE UNIT (TRU)
Cellule d'appui à l'action Pédagogique

IN COLLABORATION WITH
En collaboration avec

THE REGIONAL INSPECTORATES OF PEDAGOGY AND

THE SUBJECT TEACHERS' ASSOCIATIONS (STA)

Friday, 20/04/2024 ADVANCED LEVEL

Subject Title	**Computer Science**
Paper Number	**Paper 2**
Subject Code Number	**0795**

TWO AND A HALF HOURS

INSTRUCTIONS TO CANDIDATES:

Answer any SIX questions.

All questions carry 17 marks each. For your guidance, the approximate mark for each part of a question is indicated in brackets.

You are reminded of the necessity for good English and orderly presentation in your answers.

In calculations, you are advised to show all the steps in your working, giving your answer at each stage.

Calculators are NOT allowed

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1. (i) (a) Add the decimal numbers `18` and `−72` using 8-bit two's complement. **(4 marks)**

(b) Apply a binary shift two places to the right on the bit pattern `10101000`. Convert the binary number obtained to decimal and state the arithmetic effect of applying a right binary shift of two to a binary number. **(3 marks)**

(ii) A combinational logic circuit has three inputs A, B and C, and two outputs X and Y. Output X is the sum bit when the values of A, B and C are added and output Y is the carry bit when they are added.

(a) What is meant by a combinational logic circuit? **(2 marks)**

(b) Draw a truth table for this circuit with inputs A, B, C, and outputs X and Y. **(4 marks)**

(c) Draw a logic circuit diagram for the Boolean expression Q= A•B+$\overline{(B \oplus C)}$ **(4 marks)**

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2. (i) (a) RAM may be either SRAM or DRAM. Describe the difference between these. **(2 marks)**

(b) State **two** advantages of solid-state drives over hard disk drives. **(2 marks)**

(c) A computer's memory is composed of 8K words of 32 bits each. Determine the number of bits that are required to address each memory location if the smallest addressable memory unit is a word. **(2 marks)**

(d) Draw a diagram to represent the memory hierarchy you might expect to find in a typical high performance personal computer. **(4 marks)**

(ii) An instruction format uses five bits to represent 32 basic machine operations, one bit for the addressing mode and ten bits for the operand field, as shown in **Figure 1** below.

Opcode						Operand									
Basic machine operation					Addressing mode										
0	0	0	0	1	1	0	0	1	1	1	0	1	1	0	1

Figure 1

(a) How many different opcodes is the machine potentially capable of supporting? **(2 marks)**

(b) What is an addressing mode? How many addressing modes can this instruction format support? **(2 marks)**

(c) Explain what indirect addressing is and then determine the number of memory locations that can be addressed using the instruction format above. **(2 marks)**

(d) State **one** application of indexed addressing in computing. **(1 mark)**

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3. (i) (a) What is meant by CPU scheduling? **(1 mark)**

(b) Explain the difference between pre-emptive and non-pre-emptive scheduling. **(2 marks)**

(c) Explain when preemption takes place in each of shortest remaining time next and round-robin scheduling algorithms. **(2 marks)**

(d) What is convoy effect? In which scheduling algorithm is a convoy effect likely to occur? **(2 marks)**

(ii) (a) What is cache memory? How is cache memory different from virtual memory in terms of purpose? **(3 marks)**

(b) Explain why excessive use of virtual memory can degrade the performance of a computer. **(3 marks)**

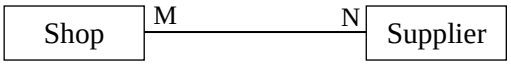
(c) Explain the difference between a placement policy and a replacement policy in memory management, stating an example of each. **(4 marks)**

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4. (i) (a) Describe each of the following database keys: *primary key*, *foreign key*, *composite key* and *candidate key*. **(4 marks)**

(b) Describe each of the following database integrity constraints: *referential integrity* and *entity integrity* **(2 marks)**

(ii) Rainbow Retail Group (RRG) has a number of shops which buy their goods from one or more suppliers. RRG wants to create a database that will be used to keep information about their *Shops* and *Suppliers*. The structure they plan to use is shown in the diagram below:



(a) Describe the main components of an entity-relationship diagram and give an example of each from the description above. **(5 marks)**

(b) State and describe the degree of the relationship between Shop and Supplier. **(2 marks)**

(c) Suggest **one** reason why this structure would not be suitable when implementing the database. Draw a new version of the structure to solve this problem. **(4 marks)**

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5. (i) (a) Describe the following terms as used in object-oriented programming (OOP): *object*, *abstraction*, *inheritance* and *coupling*. **(4 marks)**

(b) With the use of diagrams only and three classes A, B and C, distinguish between multiple inheritance and multi-level inheritance. **(2 marks)**

(c) What is code reuse? Identify **two** main concepts that allow for reuse of code in OOP. **(3 marks)**

(ii) (a) Explain the difference between source code and object code. **(2 marks)**

(b) Describe **two** types of errors that can occur in a computer program, giving a specific example of each **(6 marks)**

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6. (i) (a) What is a prototype in software development? **(2 marks)**

(b) List **four** steps in the prototyping process. **(2 marks)**

(c) Describe the following software quality attributes: *usability*, *portability*, *compatibility* and *fault-tolerance*. **(4 marks)**

(ii) Consider the array below where array indices have been included above the array.

[0]	[1]	[2]	[3]	[4]	[5]	[6]
0	1	2	3	5	8	13

(a) State the comparisons that would be made when the *linear search* algorithm is used to search for the value 5 in the above array. **(3 marks)**

(b) State the comparisons that would be made when the *binary search* algorithm is used to search for the value 5 in the above array. **(2 marks)**

(c) State **two** factors that may affect the performance of a searching algorithm. **(2 marks)**

(d) State in Big-O, the worst case time complexity for each of the searching algorithms in (ii)(a) and (ii)(b) above. **(2 marks)**

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7. (i) (a) What is a subroutine? **(2 marks)**

(b) State **two** advantages of subroutines in programming. **(2 marks)**

(c) State and describe **two** ways by which parameters can be passed to a subprogram. **(6 marks)**

(ii) Study the following pseudo code algorithms labeled **(a)** and **(b)** below and answer the questions that follow.

```
Sub routine(m,n)
  r ← 1
  if(n > m - n)then
    n = m - n
  endif
  for i ← 0 to n-1 do
    r ← r * (m - i)
    r = r / (i + 1)
  next i
  return r
EndSub
```

(a)

```
Begin
  n = 4
  for i ← 0 to n-1 do
    for j ← 0 to i do
      print(routine(i,j)," ")
    next j
    println    /*go to next line*/
  next i
End
```

(b)

(a) Identify **two** actual and **two** formal parameters used in the above algorithms. **(2 marks)**

(b) Is the subprogram `routine()` a function or a procedure? Justify. **(2 marks)**

(c) Determine the output of algorithm **(b)** above. **(3 marks)**

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8. (i) Describe the function of the following devices in a computer network.

(a) Router **(2 marks)**

(b) Modem **(2 marks)**

(c) Repeater **(2 marks)**

(ii) (a) Many fast broadband connections use fiber optic cables instead of copper cables. State **two** reasons why fiber optic cable is the preferred choice. **(2 marks)**

(b) Draw a diagram to show how a client-server network may be set up using the following devices: two (2) *workstations*, *a switch*, *a server* and *a printer*. **(2 marks)**

(c) State **three** advantages of networking computers. **(3 marks)**

(iii) Explain the difference between the following pairs of networking terms:

(a) Half-duplex and full-duplex communication **(2 marks)**

(b) Synchronous and asynchronous transmission. **(2 marks)**

THE END

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