REPUBLIQUE DU CAMEROUN
*Paix-Travail-Patrie*

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TEACHERS' RESOURCE UNIT TRU-RIP-BTA MOCK EXAMS NORTH WEST REGION

# A ATVE

REPUBLIC OF CAMEROON
*Peace-Work-Fatherland*

MINISTRY OF SECONDARY EDUCATION

TEACHERS' RESOURCE UNIT
REGIONAL BRANCH FOR THE NORTH WEST

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MARCH 2024

| The Teachers' Resource Unit and the Regional Inspectorate of Pedagogy in collaboration with COSTA | SUBJECT CODE NUMBER **0795** | PAPER NUMBER **2** |
|---|---|---|
| GENERAL CERTIFICATE OF EDUCATION REGIONAL MOCK EXAMINATION | SUBJECT TITLE **COMPUTER SCIENCE** | |
| ADVANCED LEVEL | | |

**Time Allowed: THREE HOURS**

**INSTRUCTIONS TO CANDIDATES**

Mobile phones are **NOT ALLOWED** in the examination room.

**Answer any four questions**

1. (i) Describe what is stored on the following devices, while justifying why that type of memory is appropriate: (2 marks)
(a) RAM (2marks)
(b) ROM (2 marks)
(ii) a) Briefly state the purpose of the control unit (2 marks)
(b) Briefly state the purpose of the arithmetic/logic unit (ALU)
(c) Speed mismatch is a problem that arises with the use of computer systems; justify why there is speed mismatch between user, peripheral and processor. (3 marks)
(iii)(a) Differentiate between the following terms as used in computer system Interrupt and Polling (2marks)

(b) The CPU uses pipelining to improve efficiency. Briefly explain what is meant by the term 'pipelining'. (2 marks)

(c) Identify one way that the Harvard architecture differs from the Von Neumann architecture. (2 marks)

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2. (i) Given the following Boolean expression:

$$\overline{A}B\overline{C} + \overline{A}BC + A\overline{B}\overline{C} + A\overline{B}C$$

(a) Simplify the above expression (3 marks)
(b) Draw a logic circuit for the simplified expression in i(a (1 marks)
(ii) Given the following denary number: 20.25
(a) Identify one reason why values stored using a floating point representation must be in normalized form. (1 mark)
(b) Convert this number into binary (2 marks)
(c) Normalize this number into a floating point number with 8-bit mantissa and 4-bit exponent (3 marks)
(iii) A RAM chip is designated by 512K by 8.
(a) Determine the total number of addressable units (2 marks)
(b) Determine the total number of bits used for the address lines (2 marks)
(c) Determine the total number of bits used for I/O operations (2 marks)
(d) Calculate the total capacity of this memory (1 mark)

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3. (i)(a) Briefly state what is meant by deadlock (1mark)
(b)Briefly state why page faults do occur and describe the actions taken by the operating system when a page fault occurs. (3 marks)
(ii) (a) Identify the function of the ready queue, as in operating system. (1 mark)
(b)Briefly explain race condition in an operating system using an example of your choice, involving two processes? (5 marks)
(c) State three requirements of any solution to the critical sections problem? Why are the requirements needed? (6 marks)
(d) Multi-programming (or multi-tasking) enables more than a single process to apparently execute simultaneously. Briefly state how this is achieved on a mono-processor? (1 mark)

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4. The Internet can be used for video conferencing and a web browser is used to request and display a page stored on an internet web server. Data can be transmitted over the Internet using either packet switching or circuit switching.
(a)State two problems that could arise if video conferencing were to use packet switching (2 marks)
(b)When transmitting data on the Internet there are concerns for: confidentiality, authenticity and integrity. Explain each of these terms. (3 marks)
(c) Briefly describe the main purpose of the DNS. (2 marks)
(ii)(a) Briefly describe the physical layer of the OSI model, and state two materials that can be used in the layer. (4 marks)
(iii)(a) You are a sound engineer recording a singer. Describe why the sound must be converted to a digital format before it can be stored on a computer system. (3 mark)
(b)Briefly state the purpose of the start bit and stop bit in asynchronous serial transmission. (1 mark)
(c)Briefly describe an IPv4 address and state one example of an IVv4 address in class C (2 marks)

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5. The Regional Delegation stores information about the Fenasco games in a relational database. The details of the track events are stored using these relations:
Athlete (**AthleteNumber**, Forename, Surname, School, Gender, DateOfBirth)
Race (**RaceNumber**, Gender, Distance, Type, StartTime)

Each athlete who takes part in a Race is given a unique AthleteNumber. Athletes can run in more than one Race. If they do, they keep the same AthleteNumber for the entire day. Many Races are run throughout the day. An example Race would be the boys' 100m., which is the second Race of the day, and starts at 11:00. A sample entry in the Race table for this Race is shown in table below.

| RaceNumber | Gender | Distance | Type | StartTime |
|---|---|---|---|---|
| 2 | Boys | 80 | 100m | 11:00 |

Table 1

(i)(a) Draw an Entity-Relationship (E-R) diagram for the relations Athlete and Race. (2 marks)

(b) Briefly state why, the relationship drawn in (a) is impossible to implement with relational database software. (2 marks)

(c) Propose a solution to solve the problem identified in (b). (2 marks)

(d) State all the appropriate attribute name(s) and identify the correct primary key for this relation. (2 marks)

(ii) A video streaming service uses a relational database. An extract of the data from two tables from this database is shown in table 2.

| Username | FirstName | StartDate | PackageType |
|---|---|---|---|
| User001 | Amaya | 08/05/2016 | Premium |
| User002 | Amit | 06/06/2019 | Basic |
| User003 | Tom | 17/08/2019 | Free |
| User004 | Kareem | 08/08/2017 | Basic |
| User005 | Sarah | 25/03/2020 | Premium |

Membership

| PackageType | CostPerMonth(£) | Adverts |
|---|---|---|
| Premium | 12.99 | false |
| Basic | 7.99 | true |
| Free | 0.00 | true |

Package

Table 2

State why or not the tables are in 1NF, and justify your answer. (3 marks)

(iii) Given the following relation: Vehicle (**Number**, Type, Seats)

(a) Briefly state why this relation is NOT in 3NF? (2 marks)

(b) Normalize this relation into 3NF. (4 marks)

6. (i)(a)Identify two advantages on the use of iterative functions over recursive functions. (2 mark)

(b) Briefly state and describe two characteristics of a recursive function. (4 marks)

(ii) Figure 1 shows a flowchart of a well-known algorithm.

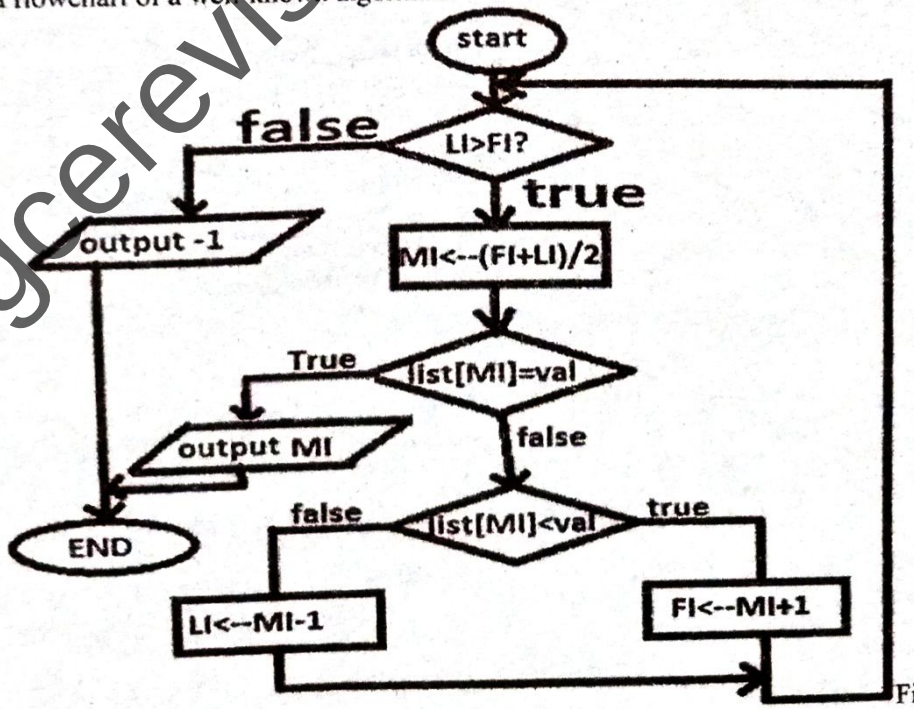


Figure 1

(a) Identify which algorithm is represented on the flowchart. (2marks)
(b) State the time complexity of the algorithm. (1mark)
(c) Which problem solving method is used in that algorithm? (1 mark)
(d) State the base condition(s) found on this algorithm (2marks)
(e) Produce the equivalent representation of this algorithm in natural language (5 marks)

7. (i) Briefly State what is meant by each of the following
a) a local variable
b) a global variable
c) a parameter passed by value
d) a parameter passed by reference. (2+2+2+2 marks)
(ii) Given the following code fragment:

```
int k = 0, p;
for (k=0; k>p; k++) do
Print "Some text";
Print "***";
Endfor
```

(a) State the output upon running the instructions. Justify your answer (2 marks)
(b) You intend to display the Print statements 8 times. Rewrite the fragment of code in order to obtain the result(s) as required. (2 marks)
(c)Evaluate the time complexity for this algorithm, after your adjustments in (b). (2 marks)
(iii) Design a suitable hashing function such that, the results of the hashing function should be such that every index of the array can be addressed directly. The simplest hashing function gives us addresses between 0 and n (For illustrative purpose, choose n to be 9)

```
function hash (key)
address <- key mod(n + 1)
return address
endfunction
```

(b) Using a trace table demonstrate how you could store records with the following customer IDs: 45876, 32390, 95312, 64636, 23467. (2 marks)
(c)Is there any problem encountered in inserting the keys? Justify your answer. (1 mark)

8. (i) A company specializes in creating web sites for customers. As part of the process of designing a site the company will use diagrams in order to make understanding easier.
(a) State and describe two types of diagrams that may be used by the company. (2 marks)
(b) It will be important to produce user documentation for new systems. By referring to the two different types of users of the new system, describe the documentation(s) which will be produced. (2 marks)
(ii) A systems analyst is commissioned by a company to produce a computerized system in its offices.
(a)State the importance to the end user (1 mark)
b) State three things which would need to be considered for the implementation (installation) of new software (3 marks)
(iii) Briefly define the following terms as used in Object oriented programming:
(a) Class (2 marks)
(b)Polymorphism (2 marks)
(iv) Evaluate the following arithmetic operations:
(a) 3 10 5 + * (1 mark)
(b) 9 8 7 9 3 - * + - (2 marks)
(c) 5 1 2 + 4 * + 3- ( 2 marks)

**END**