THE UNITED REPUBLIC OF TANZANIA
NATIONAL EXAMINATIONS COUNCIL OF TANZANIA
ADVANCED CERTIFICATE OF SECONDARY EDUCATION
EXAMINATION

136/1   **COMPUTER SCIENCE 1**

(For Both School and Private Candidates)

Time : 3 Hours   **ANSWERS**   **Year : 2014**

Instructions

1. This paper consists of sections A and B with a total of **thirteen (13)** questions.

2. Answer **all** questions in section A and **two (2)** questions from section B.

3. Section **A** carries **sixty (60)** marks and section **B** carries **forty (40)** marks.

4. Communication devices and any unauthorised materials are **not** allowed in the examination room.

5. Write your **Examination Number** on every page of your answer booklet(s).

1. (a) Explain the concept of bus topology and its advantages

Bus topology is a type of network arrangement where all computers and devices are connected to a single central communication line known as a bus or backbone. Data sent from one computer travels along the bus, and all other devices connected to it can receive the data, although only the intended recipient processes it.

One advantage of bus topology is that it is simple and easy to set up, making it cost-effective for small networks.

Another advantage is that it uses less cabling compared to other topologies like star topology, which reduces installation costs.

It also allows easy connection of additional devices to the network since new devices can be added without disturbing the entire network.

However, despite its advantages, bus topology can become slow and unreliable if too many devices are connected or if the backbone fails.

(b) Describe types of transmission media by giving examples for each type.

Transmission media are physical or non-physical channels used to carry data signals between devices in a computer network.

One type is guided transmission media, which uses physical paths for signals to travel. Examples include twisted pair cables such as telephone wires, coaxial cables used in cable TV connections, and fiber optic cables that transmit data using light.

Another type is unguided transmission media, also known as wireless media. In this case, data is transmitted through the air without a physical path. Examples include radio waves used in Wi-Fi networks, microwaves used for long-distance communication links, and infrared waves used in remote controls.

2. (a) Convert hexadecimal number B2916 to its decimal equivalent

Hexadecimal B2916 = $(B \times 16^3) + (2 \times 16^2) + (9 \times 16^1) + (1 \times 16^0)$

B in decimal is 11

$= (11 \times 4096) + (2 \times 256) + (9 \times 16) + (1 \times 1)$

$= 45056 + 512 + 144 + 1$

$= 45713$

Therefore, B2916 in decimal is 45713.

(b) Convert 101.111102 to its decimal equivalent

Binary $101.11110_2 = (1 \times 2^2) + (0 \times 2^1) + (1 \times 2^0) + (1 \times 2^{-1}) + (1 \times 2^{-2}) + (1 \times 2^{-3}) + (1 \times 2^{-4}) + (0 \times 2^{-5})$

$= 4 + 0 + 1 + 0.5 + 0.25 + 0.125 + 0.0625 + 0$

$= 5.9375$

Therefore, 101.11110_2 in decimal is 5.9375.

(c) Use Boolean laws of algebra to prove the Boolean expression $A + AB = A$

Start with $A + AB$

Apply the absorption law: $A + AB = A$

Proof:

$A + AB = A(1 + B)$

$1 + B = 1$

Therefore $A \times 1 = A$

Hence, $A + AB = A$ is true.

3. (a) Describe three methods that a programmer can use to make C++ code understood to allow the computer engineer to maintain it.

A programmer can use meaningful variable and function names. This makes it easy for another person to understand the purpose of each element in the code.

A programmer can also use comments within the code. Comments provide explanations about what specific lines or blocks of code are doing, which helps during maintenance.

Another method is proper code indentation and formatting. Structured and well-formatted code improves readability and makes debugging or modification simpler.

(b) Explain why header file(s) are very important in every C++ program.

Header files are important because they contain definitions and declarations of functions, constants, and classes that can be reused in different programs. They help in modular programming.

They also reduce duplication of code since the programmer only needs to include the header file instead of rewriting function prototypes or constants.

Header files allow better organization of code by separating interface declarations from implementation, making programs more manageable.

(c) Explain the importance of break at the end of each switch…case statement.

The break statement prevents the program from executing the next case after the required one is completed. Without break, the program continues into the next case, a condition called fall-through.

It ensures that only the matching case block runs, which gives correct and predictable results.

It also improves efficiency of the switch statement by ending execution once the desired case has been handled.

4. (a) Provide the formula in cell E8 which is used to work out the total money taken for "The manual" event

The formula in cell E8 would be:

= C8 * D8

where C8 contains the number of tickets sold and D8 contains the cost per ticket.

(b) Write function statement which was in cell G4

The function in G4 could be:

= SUM(E4:E7)

to add up total money from different events.

(c) Identify the cells which would be automatically updated if the value in C7 was changed to 2000

If C7 is changed, then E7 (total for that event) will be automatically updated because it depends on C7. Consequently, G4 (the overall sum) will also be updated.

(d) Write the formula to find maximum cost of event

The formula would be:

= MAX(D4:D8)

which finds the highest ticket cost from the list of events.

5. (a) State the type of relationship between the two tables

The relationship between student details and teacher details is a many-to-many relationship, since many students can be taught by many teachers.

(b) Draw the normalized relationship between the student's details and teacher's details in the form of entity-relationship diagram

In normalized form, we create three entities:

• Student (StudentID, Name, etc.)

- Teacher (TeacherID, Name, etc.)

- Teaching (StudentID, TeacherID)

The Teaching entity resolves the many-to-many relationship into two one-to-many relationships.

(c) Explain the meaning of primary and foreign keys by giving examples using the given tables

A primary key is a unique identifier for each record in a table. For example, StudentID in the student's details table is the primary key because it uniquely identifies each student.

A foreign key is a field in one table that links to the primary key in another table. For example, in the Teaching table, StudentID is a foreign key that references the Student table, and TeacherID is a foreign key that references the Teacher table.

6. (a) Explain the concept of software piracy by giving example

Software piracy is the illegal copying, distribution, or use of computer software without permission from the copyright holder. It violates intellectual property rights of the developers or companies that created the software.

An example of software piracy is when someone downloads and installs a cracked version of Microsoft Office without purchasing a valid license. This denies the company its rightful revenue and is punishable under copyright laws.

(b) Describe three measures taken to prevent data against unauthorized access

One measure is the use of strong passwords and authentication systems. These ensure that only authorized users can access sensitive data.

Another measure is data encryption, which converts information into unreadable form so that even if attackers gain access, they cannot interpret it without a decryption key.

A third measure is access control policies such as firewalls and user permissions. These restrict who can view, modify, or delete data within a system.

7. (a) Explain why it will be necessary to initialize the array CONTESTANT_TOTALS() before to run the algorithm

It is necessary to initialize the array CONTESTANT_TOTALS() so that each element starts with a defined value, usually zero. Without initialization, the array may contain garbage values, which will lead to incorrect calculations when the program runs.

(b) Write a FOR loop which can be used to initialize the array CONTESTANT_TOTALS() at the beginning of the algorithm

FOR I = 1 TO N
CONTESTANT_TOTALS(I) = 0
NEXT I

This loop assigns zero to each element of the array before processing begins.

(c) Explain what happens when the program based on this algorithm is executed

When executed, the algorithm will process contestant scores and add them to the initialized array. Since the array was first set to zero, the totals will be calculated correctly without interference from undefined values.

(d) Re-write line 12 to produce the correct result

If line 12 was meant to add scores, the correct statement should be:
CONTESTANT_TOTALS(I) = CONTESTANT_TOTALS(I) + SCORE

This ensures that the new score is added to the contestant's existing total.

8. Describe three steps for planning and creating Visual Basic project

The first step is identifying the problem and requirements. This involves understanding what the project should do, who will use it, and what features are necessary.

The second step is designing the user interface. The programmer uses Visual Basic tools to draw forms, buttons, labels, and other controls that users will interact with.

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The third step is writing and testing the code. This includes attaching code to controls, debugging errors, and running the project to ensure that it works as intended.

9. Write a C++ program that reads numbers entered by a user and the program should be able to find their sum and print the average of the numbers

```cpp
#include <iostream>

using namespace std;

int main() {

    int n, i;

    float num, sum = 0, average;

    cout << "Enter the number of values: ";

    cin >> n;

    for(i = 1; i <= n; i++) {

        cout << "Enter number " << i << ": ";

        cin >> num;

        sum = sum + num;

    }

    average = sum / n;

    cout << "Sum = " << sum << endl;

    cout << "Average = " << average << endl;
```

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```
    return 0;

}
```

This program first asks the user for how many numbers to enter, then calculates the sum and average and displays them.

10. (a) Describe four symbols used in a flowchart diagram

One symbol is the oval, which represents the start or end of a process.

Another is the rectangle, which represents a process or instruction to be executed.

The diamond symbol is used to represent a decision point where a condition is checked and the flow may branch.

The parallelogram symbol is used to represent input or output operations, such as reading from the user or displaying results.

(b) Differentiate pseudocode from algorithm

Pseudocode is a detailed description of the steps in a program written in plain, human-readable language that resembles programming but is not actual code.

An algorithm, on the other hand, is a step-by-step logical procedure for solving a problem. It can be expressed in natural language, flowcharts, or pseudocode, and serves as the blueprint for program development.

11. Describe eight stages of program development in their respective order

The first stage is problem identification. In this stage, the programmer understands and defines clearly what problem the program is supposed to solve.

The second stage is feasibility study. Here, the programmer examines whether the problem can be solved using available resources, time, and technology.

The third stage is program design. This involves creating algorithms, flowcharts, and pseudocode to describe how the program will function before writing the actual code.

The fourth stage is coding. At this point, the programmer writes the actual program using a programming language such as C++, Java, or Python.

The fifth stage is program testing. The written code is tested to detect and correct errors, ensuring that it produces the expected results.

The sixth stage is documentation. The programmer prepares manuals and explanations so that future users and maintainers can understand the program.

The seventh stage is implementation. The program is installed and put into use in the intended environment.

The eighth stage is maintenance. The program is updated, improved, and corrected when new errors or user requirements are discovered.

12. Explain how the computer hardware and software including communications and networking have made automation to be possible in our daily life by referring to eight areas

In the banking sector, hardware such as ATMs and software for online banking have automated money withdrawal, transfers, and payments, reducing the need for manual transactions.

In the healthcare sector, hospital management software and networked systems have automated patient records, laboratory tests, and appointment scheduling, improving efficiency.

In education, e-learning platforms, projectors, and computer-based examinations have automated teaching and learning processes, making education more accessible.

In manufacturing, robotics and automated production lines controlled by computer software and sensors have replaced manual labor in repetitive and dangerous tasks.

In transport, ticketing systems and traffic control software have automated booking, payments, and traffic management, leading to safer and faster journeys.

In offices, software such as word processors, spreadsheets, and email systems have automated documentation, communication, and data analysis, improving productivity.

In agriculture, automated irrigation systems and farm management software have allowed farmers to control water use, planting, and harvesting with minimal manual effort.

In communication, mobile phones, emails, and video conferencing have automated information exchange, enabling people to communicate instantly regardless of location.

13. Describe eight factors to be considered for successful Website Development

The first factor is clear purpose. A website should have a well-defined goal, such as providing information, selling products, or offering services.

The second factor is user-friendly design. The website should be easy to navigate, with menus and links that are clear and simple.

The third factor is responsiveness. A good website should be accessible on different devices such as computers, tablets, and smartphones without losing functionality.

The fourth factor is content quality. The information provided should be accurate, relevant, and regularly updated to keep users engaged.

The fifth factor is website speed. Pages should load quickly to prevent users from losing patience and leaving the site.

The sixth factor is security. Measures such as SSL certificates and secure login systems should be implemented to protect user data and prevent cyberattacks.

The seventh factor is search engine optimization (SEO). The website should be optimized for search engines so that it appears among top results when users search for related content.

The eighth factor is scalability. The design should allow the website to grow and accommodate new features or larger traffic in the future.

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