

Exemplar examination

Paper 1: Theory

Time: 3 hours

Marks: 120

INSTRUCTIONS AND INFORMATION

1. Answer all the questions.
2. Read all the questions carefully.
3. Number the answers according to the numbering system used in this question paper.
4. Questions may be answered in any order, but subsections of questions must be kept together.
5. Start each question on a new page.
6. Only use a black or a blue pen.
7. Write neatly and legibly.

QUESTION 1: Short questions

1.1 Multiple choice questions

Only write the question number and the corresponding letter for questions 1.1.1 to 1.1.10.

e.g. 1.1.11 E

- 1.1.1** The ... chip stores configuration data of the computer to start or boot a computer. (1)
- A. BIOSA
 - B. POST
 - C. CMOS
 - D. ROM
- 1.1.2** Which of the following is not one of the five steps of the instruction processing cycle carried out by the CPU? (1)
- A. Fetch
 - B. Decode
 - C. Locate
 - D. Execute
- 1.1.3** In a flowchart, this symbol represents input or output statements. (1)
- A. Rectangle
 - B. Diamond
 - C. Circle
 - D. Parallelogram
- 1.1.4** Which one of the following programming languages is compiled? (1)
- A. Python
 - B. Ruby
 - C. C++
 - D. PHP
- 1.1.5** Which of the following is not a commonly used data validation method? (1)
- A. Format check
 - B. Data type check
 - C. Doubly entry
 - D. Presence check
- 1.1.6** Which of the following is an example of indirect input hardware? (1)
- A. Chip reader
 - B. Keyboard
 - C. PIN keypad
 - D. Tap card
- 1.1.7** Which Linux command provides more information about a command and how to use it? (1)
- A. man
 - B. clear
 - C. cp
 - D. mkdir

- 1.1.8** At which stage of the program development life cycle is top-down programming and flowcharts or pseudocode used?
- Analysing the requirements
 - Designing the solution
 - Coding the program
 - Testing and debugging
- (1)
- 1.1.9** Which pin on the Arduino board serves as the return path for current flow in an electrical circuit?
- 3V3
 - 5V
 - GNDD
 - TX
- (1)
- 1.1.10** On the front end of compiler design, when the source code is converted to an intermediate representation, which kind of analysis converts the program into a sequence of tokens?
- Lexical analysis
 - Syntax analysis
 - Semantic analysis
 - Code analysis
- (1)

1.2 Identify the term

Write the word or term matching the description given next to the question number for questions 1.2.1 to 1.2.5.

- 1.2.1** A software application that provides comprehensive facilities to computer programmers for software development. The application normally consists of a compiler, a source code editor and a debugger. (1)
- 1.2.2** A procedure or list of instructions used for solving a problem or performing a calculation. (1)
- 1.2.3** A variable data type that can only be either true or false. (1)
- 1.2.4** A computer architecture with a smaller instruction set where each instruction is very primitive. (1)
- 1.2.5** Software that is available to use free of charge without any limitations, but does not typically include access to source code. (1)

[15]

QUESTION 2: Hardware and software

- 2.1** There are many parts of a computer that make an impact on the computer performance. The specifications of the CPU in a computer can make a big impact on computer performance. Answer the following questions about hardware components of a computer.
- 2.1.1** Expand the acronym CPU. (1)
- 2.1.2** State TWO factors that affect the speed of a CPU and explain how each factor affects the CPU speed. (4)
- 2.1.3** RAM is a form of primary memory. Explain why increasing the amount of RAM improves the performance of a computer. (3)
- 2.1.4** List THREE differences between SRAM and DRAM. (3)
- 2.2** A high-level programming language needs to be translated into machine code to be executed by the computer. Explain the difference between a compiler and interpreter in terms of scanning. (2)

- 2.3 List TWO differences between system software and application software. (2)
- 2.4 Write the terminal commands for Linux to do the following.
- 2.4.1 List the contents of the current folder. (1)
- 2.4.2 Navigate to the root directory. (1)
- 2.4.3 Create a folder called *Test* in the current directory. (1)

[18]

QUESTION 3: Problem solving

You have been tasked with designing a program that will manage purchases at a school tuckshop. Answer the following questions.

- 3.1 A large problem like this needs to be broken down into smaller parts to start designing a solution. State the term that is used to describe the process of breaking down a complex problem into smaller parts. (1)
- 3.2 In Polya's methodology of solving a problem, there are four principles. State the FOUR principles of Polya's methodology. (4)
- 3.3 When starting to solve a problem like this, one must identify who the users are and what their needs are.
- 3.3.1 Identify TWO potential users of the tuckshop management system. (2)
- 3.3.2 Write a user story for one of the users you have identified. (3)
- 3.4 Once an algorithm has been developed, it then needs to be tested. Explain the concepts of white box and black box testing. (2)
- 3.5 When items are bought from the tuckshop, the quantity needs to be reduced by the number of items bought so that there is an accurate record of the number of stock items left.

Draw a flowchart to depict the following scenario:

- The number of items bought needs to be read from the keyboard.
- The current number of items in stock is stored in a variable called *count*. Update this variable by calculation and then storing the new number of items in stock.
- The new number of items needs to be printed out.
- If there are no more items left, a message needs to be printed to say: "Buy new stock".

For example:

If *count* is 10 initially, and the input is 7:

Output :

Count = 3

If *count* is 10 initially, and the input is 11:

Output :

Count = -1

Buy new stock

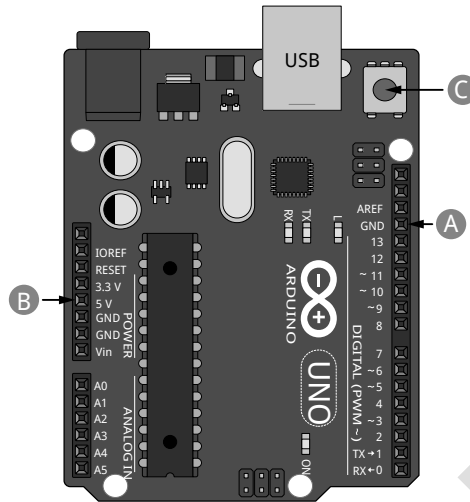
Your algorithm should work with any starting value of count. (5)

- 3.6 List and explain TWO benefits of flowcharts. (4)

[21]

QUESTION 4: Microprocessors and microcontrollers

- 4.1 Define the term *physical computing*. (1)
- 4.2 List FOUR differences between *microprocessors* and *microcontrollers*. (4)
- 4.3 Consider the standard Arduino board. Identify and explain the use of each of the components labelled A to C. (6)



[11]

QUESTION 5: Programming tools and utilities

- 5.1 Git is an example of a version control system.
 - 5.1.1 Give TWO reasons why it is important to use a version control system. (2)
 - 5.1.2 What is the Git command used to initialise an existing directory as a Git repository? (1)
- 5.2 Consider the following code snippet that contains an error.

```

1 #include <iostream>
2 using namespace std;
3
4 int main() {
5     cout << Hello World
6     return 0;
7 }
    
```

- 5.2.1 Identify the line of code that has an error. (1)
- 5.2.2 What type of error is this? Explain your answer. (2)
- 5.3 List THREE common debugging techniques. (3)

[9]

QUESTION 6: Solution development

- 6.1 What type of file is produced by the C/C++ compilation process? (1)
- 6.2 Explain what a comment is used for in programming and provide a reason why it is important to add comments to your code. (2)

- 6.3 What is the purpose of the math.h or cmath header file in C++? (2)
- 6.4 Describe THREE common side effects of logic errors. (3)
- 6.5 Explain what a magic number is in programming and provide TWO advantages of using a constant for magic numbers when programming. (3)
- 6.6 Evaluate the output of the following code snippet.

```
int x = 1;
int y = 3;
int z = -2;
x = z;
if (y < z) {
    y = y + z;
} else {
    z = z + y;
}
if (x == z) {
    cout << y << endl;
} else {
    cout << x << endl;
}
```

(1)

- 6.7 Explain how the integer result produced by a relation expression relates to bool true/false. (2)
- 6.8 Consider the following statement in C++:
`if(a==b || c<d){`.`
 What logical operation does this statement use? (1)
- 6.9 What type of looping structure can be used to iterate through the elements of an array in C++? (1)
- 6.10 When should you use a do...while loop instead of a while loop in C++? (2)
- 6.11 What is a sentinel? Where and for what reason would it be used in C++? Give an example to explain your answer. (3)
- 6.12 What is the purpose of a break statement and a continue statement in C++? (4)
- 6.13 Identify the local and global variables in the following code snippet and explain the terms 'scope', 'local scope' and 'global scope' using this example:

```
int x = 5;
void myFunction() {
    int y = 10;
}
```

(5)

- 6.14 Random numbers are a useful tool in programming to simulate various scenarios such as rolling a dice.
- 6.14.1 What is the difference between random numbers and pseudo random numbers in C++? (2)

- 6.14.2** Explain why generating truly random numbers is difficult. (2)
- 6.14.3** Write two lines of C++ code to initialise a random seed and generate a random number between 32 and 65 inclusive. (4)
- 6.15** Object Oriented Programming (OOP) is a programming paradigm that uses objects, classes, and their interactions to design applications and computer programs. Answer the following questions about OOP.
- 6.15.1** How do methods and attributes differ? (2)
- 6.15.2** What is instantiation? (2)
- 6.15.3** What is the purpose of a constructor? (2)
- 6.15.4** What is the phantom new line character problem in C++? (2)

[46]**TOTAL: 120**

PROMOTIONAL COPY
Additional changes may apply to the final print version

Exemplar examination

Paper 2: Design/practical/programming

Time: 3½ hours

Marks: 100

INSTRUCTIONS AND INFORMATION

1. You will have 30 minutes reading and planning time before commencement of the practical examination.
2. You will receive a script to use for planning and notes.
3. You must submit any formal planning required e.g. flow chart / pseudocode / algorithm.
4. You will need access to a computer in the exam room.
5. Answer all the questions.
6. Read all the questions carefully.
7. Number the answers according to the numbering system used in this question paper.
8. Questions may be answered in any order, but subsections of questions must be kept together.

QUESTION 1

You are a programmer working on a set of applications for a game farm. The applications will calculate the total cost of a visit and record visitors' animal sightings on the game farm. For each question, create a new program to answer the sub-questions.

- 1.1** It costs R220 for an adult ticket and R80,50 for a child ticket per day to visit the game farm. Write a program to calculate how much a day visit costs by answering the following questions.
- 1.1.1** Get input from the user to find out how many adults and how many children are entering the game reserve. Store the input in appropriate variables. (5)
- 1.1.2** Calculate the total cost of the day visit and output the result formatted to two decimal places and with a default leading fill character of 'R'. (7)
- 1.2** Visitors need to know how far one location is from another in the game reserve, using map coordinates. Write a C++ program to do the following:
- 1.2.1** Get input from the user of the x - and y -coordinates of the current location and the x - and y -coordinates of the destination, as integer values. (2)
- 1.2.2** Calculate the distance between the two points using the formula: (6)
- $$\sqrt{(y_2 - y_1)^2 + (x_2 - x_1)^2}$$
- 1.2.3** Output the result formatted to one decimal place in an appropriate message. (2)
- 1.3** The application uses one array to store the animals visitors find on their journey and one array to store the size of each of the animals.
- 1.3.1** In the main() function, do the following: (10)
- Ask how many animals have been spotted and initialise two arrays of that size.
 - Input the animals as elements in one of the arrays (the array may contain duplicates).
 - Input the sizes of the animals (as integer values measured in centimetres) in the other array.
 - Output the contents of each array to the screen.
- 1.3.2** The application should output what the smallest size was of the animals seen. (7)
- Write a function called FindSmallest that takes an array of integers and returns the smallest number in the array.
- 1.3.3** The application should also find the most common animal seen and print it out. (13)
- Write a function called FindCommon that takes an array of strings and returns the name of the animal that appears most often in the array.

- 1.3.4** Add code to your main() function to test the two functions you have created. See the screenshot below for example test values (although your program should work for any values inputted). (4)

```
How many animals have been spotted?
5
Input animals spotted:
rhino
giraffe
rhino
kudu
leopard
Input sizes of animals spotted (in cm):
110
320
105
108
80
Animals spotted:
rhino, giraffe, rhino, kudu, leopard,
Sizes of Animals spotted:
110, 320, 105, 108, 80,
The smallest size was: 80
The most common animal seen was: rhino
```

[56]

QUESTION 2

Write a C++ program to find the largest of three numbers (integers). Your program should do the following:

- Prompt the user to enter three numbers.
- Store the input in three appropriate variables.
- Find the largest of the three numbers.
- Output a message indicating what the largest number is.

[5]

QUESTION 3

A palindrome is a word or number that will read the same when written forwards or backwards. For example, 12321 and racecar are both palindromes.

Write a program in C++ to receive a string value as input and check if it is a palindrome. Output a message indicating if the input is a palindrome or not.

[7]

QUESTION 4

- 4.1** Open the terminal and write command-line instructions to do the following. Also, copy each command into a separate text file to submit with your program files.

- Change the current directory to the directory where you have saved all your program files.
- List the contents of the current folder.

(2)

- 4.2** Write the git commands you would use to do the following:

- Initialise the git repository in the current directory.
- Add the remote to a GitHub repository you have been given.
- Add all your program files to be committed.
- Commit the files.
- Push the files to the GitHub repository.
- Check the status of the current repository.

(10)

[12]

QUESTION 5

You have been provided with the following resources:

- Arduino UNO
- Breadboard
- LED light
- Button
- Potentiometer
- LCD display

5.1 Write a program to turn on an LED light when a button is pressed and turn it off when the button is released. (8)

5.2 Write a program that will read an analogue input from a potentiometer and output it to an LCD display. The value of the potentiometer should also control the brightness level of the LED light. Make sure the brightness stays within a reasonable range. (12)

[20]

TOTAL: 100

PROMOTIONAL COPY
Additional changes may apply to the final print version

Exemplar examination memorandum

Papers 1 and 2

PROMOTIONAL COPY

Additional changes may apply to the final print version

Paper 1: Theory

Time: 3 hours

Marks: 120

QUESTION 1: Short questions

- 1.1** Multiple choice questions
- 1.1.1** D. ROM (1)
- 1.1.2** C. Locate (1)
- 1.1.3** D. Parallelogram (1)
- 1.1.4** C. C++ (1)
- 1.1.5** C. Doubly entry (1)
- 1.1.6** B. Keyboard (1)
- 1.1.7** A. man (1)
- 1.1.8** B. Designing the solution (1)
- 1.1.9** C. GND (1)
- 1.1.10** A. Lexical analysis (1)
- 1.2** Identify the term
- 1.2.1** IDE or Integrated Development Environment (1)
- 1.2.2** Algorithm (1)
- 1.2.3** boolean (1)
- 1.2.4** RISC (1)
- 1.2.5** freeware (1)
- [15]**

QUESTION 2: Hardware and software

- 2.1** **2.1.1** Central Processing Unit ✓ (1)
- 2.1.2** Any TWO of: (1 mark for factor ✓ + 1 mark for explanation ✓)
- Number of cores – more cores means more tasks can be completed simultaneously which means that the CPU will be faster
 - Clock speed – faster clock speed means more instructions can be executed per unit of time which means that the CPU will be faster
 - Amount of cache – more cache means that frequently executed instructions can be stored on the faster cache memory rather than RAM and increase CPU speed (4)
- 2.1.3** RAM stores the instructions currently being executed by the CPU ✓. It is much faster to read/write to RAM than secondary storage such as HDD or SSD ✓ so increasing the amount of RAM increases the number of applications that can be open at a time without using slower virtual memory ✓ (3)

- 2.1.4 Any THREE of
- SRAM is faster than DRAM
 - SRAM uses transistors to store single bits of information whereas DRAM uses separate capacitors to store each bit of data
 - More expensive than DRAM
 - Uses more power than DRAM
 - SRAM used for cache memory and DRAM used for main memory
 - SRAM is less dense
 - SRAM can store many bits per chip
- (3)
- 2.2 A compiler scans the entire code before converting to binary code ✓
whereas an interpreter translates the code line by line ✓
- (2)
- 2.3 Any TWO of:
- System software is designed for managing system resources whereas application software is designed to accomplish specific tasks
 - Programming of system software is more complex than for application software
 - A computer cannot run without system software
 - System software does not depend on application software
 - System software typically written or programmed in a low-level language whereas application software is mostly written in a high-level language.
- (2)
- 2.4 2.4.1 ls ✓ (1)
- 2.4.2 cd /. ✓ (1)
- 2.4.3 mkdir Test ✓ (1)
- [18]**

QUESTION 3: Problem solving

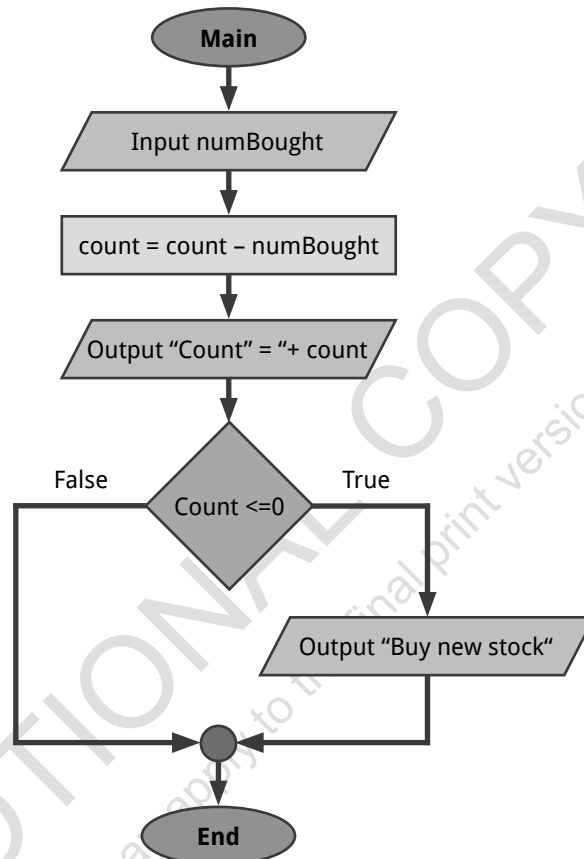
- 3.1 Decomposition ✓ (1)
- 3.2 Understand the problem ✓
Devise a plan ✓
Carry out the plan (✓
Look back ✓ (4)
- 3.3 3.3.1 Any TWO reasonable users of the system. e.g. cashier, customer, manager. (2)
- 3.3.2 A user story matching the format:
As a [type of user] ✓, I want [an action] ✓, so that [some reason]. ✓
e.g. As a manager, I want to update the quantity of stock available at the tuckshop so that I can accurately reflect current stock at the tuckshop. (3)

3.4 In white-box testing, test cases are created using programming knowledge and an internal viewpoint of the system. Typically this testing is carried out at the unit level. ✓

Black-box testing is used to assess the functionality of the program being tested without examining the internal code layout ✓ (2)

3.5 1 mark per bullet to max 5

- Start and end block
- Input numBought
- Process block to calculate new count value (count = count - numBought)
- Decision block checking if count <=0
- Output new stock count value
- Output message to buy new stock if count <= 0



(5)

3.6 Any TWO of the following (1 mark for benefit ✓ + 1 mark for explanation ✓).

- Communication: Flowcharts are a good way to communicate the logic of a system to all parties involved.
- Effective analysis: Flowcharts can help to effectively analyse a problem.
- Proper documentation: Program flowcharts are useful for required program documentation.
- Efficient coding: During systems analysis and program development phases, flowcharts serve as a guide or blueprint.
- Proper debugging: Flowcharts aid in the debugging process.
- Efficient program maintenance: Flowcharts simplify program maintenance, allowing the programmer to focus their efforts on a particular aspect.

(4)

[21]

QUESTION 4: Microprocessors and microcontrollers

- 4.1 The result of integrating software and hardware in an embedded system to allow devices to interact with the physical world. ✓ (1)
- 4.2 Any FOUR of
- Microprocessor forms heart of computer system; microcontroller forms heart of the embedded system.
 - Microprocessor has a large circuit size since memory and I/O must be connected externally, whereas microcontroller's circuit is small since memory and I/O are present internally.
 - Microcontrollers are relatively cheaper.
 - Microprocessors have less registers hence slower.
 - Microprocessor architecture based on von Neuman where data and program are store in same memory module. Microcontroller has Harvard architecture where program and memory data are separate.
 - Microprocessors are used for general purpose computing, personal computers, fast communications. Microcontrollers manufactured for specific use, washing machine, MP3 Players, consumer electronics.
 - Microcontrollers are less bulky.
 - Microprocessors have higher power consumption.
 - Microprocessors have more complex hardware. (4)
- 4.3 A: ground pin ✓ – all circuits should be linked to the GND pin. It measures and sets the voltage. ✓
- B: 5V power output pin ✓ – provides 5V power to component on the Arduino. ✓
- C: Reset button ✓ – the code loaded on the Arduino can be restarted using this button. ✓ (6)

[11]

QUESTION 5: Programming tools and utilities

- 5.1 5.1.1 Any two of
- Errors can be reverted
 - Easy collaboration
 - Backup
 - Traceability
 - Reduce duplication and errors (2)
- 5.1.2 git init ✓ (1)
- 5.2 5.2.1 Line 5 ✓ (1)
- 5.2.2 Syntax error ✓, because the statement is typed incorrectly without quotes, and the program will not run. ✓ (2)
- 5.3 Any three of
- Print debugging
 - Interactive debugging
 - Remote debugging
- Any other reasonable answer included in the textbook (3)

[9]

QUESTION 6: Solution development

- 6.1 The object file or executable file ✓ is generated during compilation (1)
- 6.2 Comments are hints that a programmer can add to make their code easier to read and understand ✓.
(Any one of the following reasons ✓)
- Comments save time
 - They help to identify important blocks of code easily
 - They help to explain why programmers used a certain method
 - They add descriptions to clarify what certain blocks of code do by adding context. (2)
- 6.3 The math.h or cmath header file in C++ is used to include preprogrammed math functions such as abs(), pow(), sqrt(), sin(), cos(), and tan() ✓. These functions enable a programmer to perform more complex mathematical operations without having to write their own code. ✓ (2)
- 6.4 Three common side effects of logic errors include incorrect program output ✓, unexpected program behavior ✓, and infinite loops. ✓ (3)
- 6.5 A magic number is a numeric literal that is used in the code without any explanation of its meaning. ✓
Using constants for magic numbers when programming makes it easier to read and understand code ✓, as well as making it easier to make changes to values if necessary, ✓ since they are all stored in one place.
OR It also helps avoid errors caused by typos or incorrect values being used throughout the code. ✓ (3)
- 6.6 -2 ✓ (1)
- 6.7 The integer result produced by a relation expression returns 0 for false ✓ and 1 for true ✓, which corresponds to the boolean values of false and true respectively. (2)
- 6.8 Logical OR operation ✓ (1)
- 6.9 A for loop can be used to iterate through the elements of an array in C++. ✓ (1)
- 6.10 A do-while loop should be used when you want the body of the loop to execute at least once ✓ regardless of whether or not the condition evaluates to true or false initially. ✓ (2)
- 6.11 A sentinel is a special value that indicates the end of a sequence of values. ✓ It is often used to terminate loops in C++. ✓ For example, when reading data from an input file, a sentinel value can be used to indicate when to stop reading data from the file. ✓ (3)
- 6.12
- Break statement: The break statement terminates ✓ the execution of a loop, switch, or label statement and transfers control to the statement following the terminated statement. ✓
 - Continue statement: The continue statement causes the program to skip ✓ the remainder of the loop body and immediately retest its condition prior to reiterating. ✓ (4)

- 6.13** The local variable is 'y' ✓ and the global variable is 'x'. ✓ Scope refers to where a variable can be accessed from or used within a program. ✓ Local scope refers to a variable that is only accessible within a specific block of code, such as within a function or loop. ✓ In this example, 'y' has a local scope since it can only be used within the function myFunction(). Global scope refers to a variable that can be accessed from anywhere in the program ✓, such as outside of functions. In this example, 'x' has global scope since it can be used both inside and outside of myFunction(). (5)
- 6.14** Random numbers are a useful tool in programming to simulate various scenarios such as rolling a dice.
- 6.14.1** Random numbers are numbers that are generated by a process that is unpredictable and cannot be determined by any known algorithm or formula. ✓ Pseudo random numbers are generated by algorithms that use a mathematical formula to produce a sequence of numbers that appear to be random, but are actually predictable. ✓ (2)
- 6.14.2** Generating truly random numbers is difficult because it requires the use of physical phenomena ✓ such as atmospheric noise or radioactive decay, which can be difficult to measure accurately and consistently. ✓ (2)
- 6.14.3** // Initialise random seed
srand(time(0)); ✓
// Generate a random number between 32 and 65 inclusive
int random_number = rand() ✓ % 34 ✓ + 32; ✓ (4)
- 6.15** Object Oriented Programming (OOP) is a programming paradigm that uses objects, classes, and their interactions to design applications and computer programs. Answer the following questions about OOP.
- 6.15.1** Methods are functions or procedures associated with a class which can be used to manipulate its attributes or perform some action on the object. ✓ Attributes are variables associated with a class which describe the characteristics of the object, such as its size, color, or shape. ✓ (2)
- 6.15.2** Instantiation is the process of creating an instance of a class ✓ from a template definition. This creates an object which can then be manipulated using methods associated with that class. ✓ (2)
- 6.15.3** A constructor is a special method used to initialise an object when it is created. ✓ It typically sets default values for attributes and allocates memory for any dynamic resources needed by the object. ✓ (2)
- 6.15.4** The phantom new line character problem in C++ occurs when a user inputs a string that includes an extra new line character at the end of the string. ✓ This extra new line character can cause unexpected behavior in programs as it is treated as whitespace and can be difficult to detect and debug. ✓ (2)

[46]

TOTAL: 120

Paper 2: Design/practical/programming

Time: 3½ hours

Marks: 100

QUESTION 1

- 1.1 1.1.1** Declare int variables to store input
 Prompt for inputs
 Input number of adults
 Input number of children
 Store inputs in int variables (5)
- 1.1.2** Multiple the number of adults stored previously
 ...by 220
 Multiple the number of children stored previously
 ...by 80.50
 Add the two numbers together
 Output result formatted to two decimal places
 ...and with default leading fill character of R (7)

Solution question 1.1:

```
#include <iostream>
#include <iomanip>
using namespace std;

int main() {
    int numAdults, numChildren;

    cout << "How many adults are entering the game reserve? ";
    cin >> numAdults;

    cout << "How many children are entering the game reserve? ";
    cin >> numChildren;

    double totalCost = (220 * numAdults) + (80.50 * numChildren);

    cout << fixed << setprecision(2) << showpoint << "The total
    cost of the day visit is R" << totalCost << endl;

    return 0;
}
```

- 1.2 1.2.1** x and y coordinates of the of the current location inputted and stored
 x- and y-coordinates of the of the destination inputted and stored (2)
- 1.2.2** $\sqrt{\text{pow}(y_2 - y_1, 2) + \text{pow}(x_2 - x_1, 2)}$ (6)
- 1.2.3** Result outputted
 ...formatted to 1 decimal place (2)

- 1.3** 1.3.1 Prompt for number of animals spotted and get input
 Initialise animal array with inputted size
 Initialise size array with inputted size
 Use for loop to loop through each array
 Prompts for inputs of animals names and sizes
 Put inputted animal names in correct places in array
 Put inputted animal sizes in correct places in array
 Loop through each array
 ...to output the contents of animals names
 ... and sizes (10)
- 1.3.2 Function FindSmallest declared
 ...with array of integers as parameter
 Initialise min value
 Loop through array
 Check if current value is less than min
 ...update min value
 Return min value (7)
- 1.3.3 Function FindCommon declared
 ...with array of strings as parameter
 Initialise common animal as first element of the array
 Initialise maxCount as 1 for comparison later on
 Loop through elements of array from 0 to size-1
 Initialise count of current element as 1
 Inner loop looping through elements of the array starting from next
 index until last index
 Check if two elements are equal
 ...increment count
 Check if count is greater than maxcount
 ...update commonAnimal
 ...update maxCount
 Return most common animal (13)
- 1.3.4 findSmallest function called correctly
 ... and result outputted
 findCommon function called correctly
 ... and result outputted (4)

Question 1.3 solution:

```
#include <iostream>
#include <string>
using namespace std;

//Function to find the smallest number in an array of integers
int FindSmallest(int arr[], int size)
{
int min = arr[0]; //initialize min as the first element of the
array
```

```

//Loop through the array and compare each element with min.
If a smaller value is found, update min.
for (int i = 0; i < size; i++) {
if (arr[i] < min) {
min = arr[i];
}
}

return min; //return smallest value found in the array
}

//Function to find the most common animal in an array of
strings
string FindCommon(string arr[], int size)
{
string commonAnimal = arr[0]; //initialize commonAnimal as
the first element of the array

int maxCount = 1; //initialize maxCount as 1 for comparison
later on

for (int i = 0; i < size - 1; i++) { //Loop through elements
of the array starting from index 0 up to second last index

int count = 1; //Initialize count of current element as 1 for
comparison later on

for (int j=i+1; j<size; j++) { //Loop through elements of the
array starting from next index until last index

if (arr[i] == arr[j]) { //If two elements are equal,
increment count by 1

count++;

}

}

if (count > maxCount) { //If count is greater than maxCount,
update commonAnimal and maxCount variables accordingly

commonAnimal = arr[i];

maxCount = count;

}

}

return commonAnimal; //return most commonly occurring animal
found in the array
}
//Main function to test above functions and output results to
screen
int main() {

int numAnimalsSpotted;

cout << "How many animals have been spotted? " << endl;

```

```

cin >> numAnimalsSpotted;

string animalsSpotted[numAnimalsSpotted];

int sizesOfAnimalsSpotted[numAnimalsSpotted];

cout << "Input animals spotted: " << endl;

for (int i=0 ; i<numAnimalsSpotted ; i++){
cin >> animalsSpotted[i];
}
cout << "Input sizes of animals spotted: " << endl;
for (int j=0 ; j<numAnimalsSpotted ; j++){
cin >> sizesOfAnimalsSpotted [j];
}
cout << "\nAnimals spotted: \n";
for (int k=0 ; k<numAnimalsSpotted ; k++){
cout << animalsSpotted [k] << ", " ;
}
cout << "\nSizes of Animals spotted: \n";
for (int l=0 ; l<numAnimalsSpotted ; l++){
cout << sizesOfAnimalsSpotted [l]<< ", " ;
}
cout<<"\nThe smallest size was: "<<FindSmallest(sizesOfAnimal
sSpotted, numAnimalsSpotted);
cout<<"\nThe most common animal seen was:
"<<FindCommon(animalsSpotted, numAnimalsSpotted);
return 0;}

```

[56]

QUESTION 2

- prompt
- get and store input
- use if statement to check if second number is largest
- use if statement to check if third number is largest (can be done in one if statement with multiple conditions)
- output message with largest number

```

#include <iostream>
using namespace std;
int main() {
    int a, b, c;
    cout << "Enter three numbers: "; // ✓
    cin >> a >> b >> c; // ✓
    int largest = a;
    if (b > largest) // ✓
        largest = b;
    if (c > largest) // ✓
        largest = c;
    cout << "Largest number is: " <<largest; // ✓
    return 0;
}

```

[5]

QUESTION 3

- prompt for and receive input string
- find out the length of the string
- compare first letter with last letter
- compare other corresponding letters (second with second last etc)
- loop used to iterate through each character
- output a message if not a palindrome
- output a message if it is a palindrome

```
#include <iostream>
#include <string>
using namespace std;
int main() {
    string str;
    cout << "Enter a string: ";
    cin >> str;
    int n = str.length();
    for (int i = 0; i < n/2; i++) {
        if (str[i] != str[n - 1 - i]) {
            cout << "The input string is not a palindrome." << endl;
            return 0;
        }
    }
    cout << "The input string is a palindrome." << endl;
    return 0;
}
```

[7]

QUESTION 4

- 4.1 cd <name of folder where files are stored> ✓
ls ✓ (2)
- 4.2 git init ✓
git remote ✓ add origin <GitHub repository URL> ✓
git add ✓ . ✓
git commit ✓ -m "Committing all program files" ✓
git push ✓ origin master ✓
git status ✓ (10)

[12]

QUESTION 5

- 5.1 components connected correctly ✓✓
One potential solution:
1. Create a variable to store the button status (pressed/released). ✓
 2. Add an event block to detect when the button is pressed and set the variable to "pressed". ✓
 3. Add an event block to detect when the button is released and set the variable to "released". ✓
 4. Create an if-else statement ✓ that checks if the variable equals "pressed" and turn on the LED ✓, else turn it off. ✓ (8)

5.2 components connected correctly ✓✓

One potential solution:

1. Create a variable to store the potentiometer value. ✓
2. Use a read analogue block to read from an analogue pin ✓ and store it in a variable. ✓
3. Use a write LCD block ✓ with two parameters – one for displaying text, another for displaying values from variables – to display both text and values on LCD display. ✓
4. Create an if-else statement ✓ that checks if potentiometer value changes ✓ and control LED brightness accordingly using a write PWM block with parameter set as potentiometer value. ✓ Brightness does not go above 100% ✓ or below 0% ✓. (12)

[20]

TOTAL: 100

PROMOTIONAL COPY
Additional changes may apply to the final print version