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University of Ruhuna- Faculty of Technology

Bachelor of Engineering Technology Honours Degree

Level 1 (Semester II) Examination, November/December 2025

Course Unit: TMS1223 Computer Programming Techniques (Theory) Duration: 2 hours

INSTRUCTIONS TO CANDIDATES:

- This paper contains **04 QUESTIONS** in **06 PAGES** including this sheet.
- **ANSWER ALL QUESTIONS.** All questions carry equal marks.
- This is a closed book examination.
- If you have any doubt as to the interpretation of the wording of a question, make your own decision, but clearly state it on the script.
- All Examinations are conducted under the rules and regulations of the University.

Q1.

a) Explain the difference between **compile-time errors** and **run-time errors** in C programming. Give **one (01)** example for each.

(3 marks)

b) List **three (03)** basic data types and describe the kind of values they can store.

(4 marks)

c) Understand the following C program (Code 1) and answer the given questions.

```
#include <stdio.h>
// This program calculates the area of a rectangle
int main() {
   float length = 8.5, width = 5.2;
   float area;
   area = length * width;
   printf("Area of the rectangle = %.2f", area);
   return 0;
}
```

Code 1

Identify and state examples for the following components in the above code.

i. Two **variable names**
ii. Two **functions**
iii. Two **keywords**
iv. The **return data type** of the `main()` function
v. An **arithmetic operator**
vi. A **header file**
vii. A **format specifier**
viii. A **comment**

(8marks)

d) Write a C program that reads an integer from the user and checks whether it is **even** or **odd**. Display an appropriate message based on the result.

(10 marks)

Q2.

a) What is the purpose of using **if-else** statement in C programming? Write a simple example to show how it is used.

(3 Marks)

b) Explain the difference between a **while loop** and a **for loop** in C programming. Provide o**ne (01)** example of each to illustrate your answer.

(6 marks)

c) Analyze the ***code 2*** below and answer the questions.

```
#include <stdio.h>

void displayCount() {
    for(int i = 1; i <= 3; i++) {
        printf("Count: %d\n", i);
    }
}

int main() {
    displayCount();
    displayCount();
    return 0;
}
```

Code 2

i. How many times does the `displayCount()` function execute in total, and how many lines of output will be displayed?

ii. Explain how using the function `displayCount()` helps to make the program more structured and reusable

(6 marks)

d) Write a C program that defines a function to check whether a given integer is **positive**, **negative**, or **zero**. The program should take a number as input from the user, call the function to determine the result, and display an appropriate message in the main() function.

(10 marks)

Q3.

a) What is the difference between a **one-dimensional array** and a **two-dimensional array** in C programming? Provide an example for each.

(4 marks)

b) Explain how a for loop can be used to go through all the elements of an array one by one. In what situations is it useful to use a loop to read or display array elements?

(2 marks)

c) Analyze the following code ***(Code 3)*** and answer the questions below.

```
#include <stdio.h>
int main() {
   int n, i, sum = 0;

   printf("Enter a number: ");
   scanf("%d", &n);

   if(n > 0) {
      for(i = 1; i <= n; i++) {
         sum = sum + i;
      }
      printf("Sum = %d", sum);
   }
   else {
      printf("Invalid input! Please enter a positive number.");
   }

   return 0;
}
```

Code 3

i. What is the purpose of the **if** statement in this program? Explain how it controls the program's behavior.

ii. Describe the role of the **for loop** in this program. How does it behave when the user enters 0 or a negative number?

iii. If the input is **5**, what will be the output of the program? Show how the answer is obtained.

(9 marks)

d) Write a C program that does the following:

i. Takes an integer n from the user as input.

ii. Using a **for loop**, calculate and display the **sum of all even numbers** from 1 to n.

iii. Using a **while loop**, calculate and display the **factorial of n**.
(Hint: Factorial of 5 = 5x4x3x2x1=120)

iv. If n is negative, use an **if-else statement** to display a message saying, "Invalid input: Please enter a non-negative integer." Ensure that the program does not attempt to calculate the sum or factorial if n is negative.

(10 marks)

Q4.

a) Explain the key difference between arrays and pointers. (2 marks)

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

c) Write down the output of the program given in ***code 4*** below.

```
#include <stdio.h>
int main () {
   int x, y, *ptr;
   x = 10;
   ptr = &x;
   y = *ptr;
   printf ("%d is stored in location %u \n", x, &x) ;
   printf ("%d is stored in location %u \n", *&x, &x) ;
   printf ("%d is stored in location %u \n", *ptr, ptr) ;
   printf ("%d is stored in location %u \n", y, &*ptr) ;
   printf ("%u is stored in location %u \n", ptr, &ptr) ;
   printf ("%d is stored in location %u \n", y, &y) ;
     *ptr = 25;
   printf ("\nNow x = %d \n", x);
}
```

Code 4

Consider the memory addresses of x, y and z as follows.

Address of x: 4908

Address of y: 4904

Address of ptr: 4900

(13 marks)

d) Consider i and j are integer values and p and q are pointers to i and j values respectively.

i) Write declaration and initialization statements for i, j, p and q variables. (Assign any preferred values for i and j)

(4 marks)

ii) Select which of the following assignment expressions are **not legal**?

```
p = &*&i;
*q = &j;
*p = *p+2;
p = p + q;
```

(4 marks)

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