ZIMBABWE EZEKIEL GUTI UNIVERSITY

FACULTY OF COMMERCE

BSC (HONS) DIGITAL TECHNOLOGY

COURSE: INTRODUCTION TO COMPUTER PROGRAMMING

CODE: CDT 101

DURATION: 4 HOURS

INSTRUCTIONS AND INFORMATION TO CANDIDATES

1. THIS IS A **PRACTICAL EXAMINATION**
2. CREATE A FOLDER ON THE DESKTOP NAMED AFTER YOUR REG_NUMBER, IN WHICH YOU WILL SAVE ALL YOUR WORK
3. ANSWER **ANY FOUR (4)** QUESTIONS IN THIS PAPER
4. ALL PROGRAMS MUST BE WRITTEN IN C PROGRAMMING LANGUAGE
5. SAVE EACH QUESTION BY ITS NUMBER E.G. QUESTION 1
6. FOR EACH QUESTION, INDICATE YOUR REG_NUMBER AND QUESTION NUMBER AS COMMENTS IN YOUR CODE
7. THIS PAPER COMPRISES 4 PRINTED PAGES
8. EACH FULL QUESTION CARRIES 25 MARKS

Question 1

Write a program that solves a quadratic equation whose values are entered by a user. Your program should have the following functions at the minimum:

- **capture_values()** that allows a user to enter the coefficients of x^2 and x, and a constant of the equation [5]
- **find_roots(),** that finds the roots of the quadratic equation [5]
- **display(),** which displays the roots of the equation [5]
- **validate(),** which checks whether the given equation has real roots or not. [5]
- **main(),** for invoking (calling) the other functions [5]

Hint: The formula for solving a quadratic equation is $x = \frac{-b \pm \sqrt{(b^2 - 4ac)}}{2a}$

Question 2

a) Write a C program that uses an array to store ten (10) integers. The program should count and display the number of negative and positive integers entered, and the average of all the ten numbers entered by a user. **Your program must use a loop.** [15]

b) Write a program that allows a user to enter a string and checks whether the string is a palindrome or not. [Hint: a palindrome is a word or number that reads the same backwards and forwards, e.g. madam, 1001] [10]

Question 3

Write a program that has a function called **calcTemperature** which accepts three arguments, **start** (for the initial value), **step** (step size for incrementing) and **end** (final value), which are all integers. The function should display all the values from **start** up to **end,** incrementing them by the step size (**step**). If the step size (**step**) is greater than the difference between **start** and **end,** then allow the user to enter a valid **step.** For example, if the user enters 4 for start, 3 for step and 12 for end, the program should output:

4

7

10

NB: include the appropriate header files and call the function **calcTemperature** in the main function to make the code execute. [25]

Question 4

(a) Write a program that converts British Pounds (GBP) to United States Dollars (USD). To convert GBP to USD, use the formula: $USD = GBP * 1.40$

Your program should display the output below:

GBP	USD
0	0.00
10	14.00
20	28.00
30	42.00
40	56.00
50	70.00

NB: Use any loop of your choice, and declare 1.40 as a constant. [10]

(b) The period of a pendulum is calculated using the formula $\boldsymbol{T = 2\pi\sqrt{\frac{l}{g}}}$ where l is the length of the string and g is acceleration due to gravity. Assuming $\pi = 3.14$ and $g = 10$, write a program that does the following:

- Allows the user to enter the length of a string in metres. If the length is zero or negative, your program should display the error message "Sorry, length cannot be zero or negative", after which the user should be allowed to enter a new value until they enter a valid value.
- Calculate the period of a pendulum, T, and displays it to 2 decimal places in a 20-character space.

NB: Your program should declare at least 2 constants. [15]

Question 5

St. Columba's College requires a computer program that allows them to capture their students' details and display them. Write a program that does the following:

a) Defines a structure called **students** with the following members: first name, surname, registration number, programme, year of birth. [6]

b) Declares an array of type **struct students** which can store records of five students [2]

c) Uses a function called **capture_details()** to accept student details for all the students. Use any loop of choice to accept the details. [5]

d) Implements a function called **compare_names()** which checks whether the first name and surname of each student are the same or not. If they are the same, it should display the message "**First name is the same as surname",** otherwise, it should display the

message "**First Name and Surname are different**". The function should accept first name and surname as parameters [5]

e) Implements a function called **show_details()** which uses a loop to display the details of all the students. [5]

f) Calls each function in appropriate function(s) to make the program run properly. [2]

NB: Include the necessary header files and mandatory function(s) to make the program run. This is supposed to be a single program, not several programs.

Question 6

Sprouts Grocery sells carrots, cabbages and tomatoes at the following prices:

- Carrots: $2 per kg
- Cabbage: $0.40 per head
- Tomatoes: $0.85 per kg.

When a customer reaches the till point of a shop, the till operator enters the quantities (in heads or kg as appropriate) for each of the above products bought. If a customer does not buy a particular product, the value zero (0) is entered. The total price is then displayed, after which the customer advances the amount s/he is paying. The till operator enters the amount paid, then the change is calculated and a receipt of payment is printed.

Write a program to simulate the above scenario at Sprouts Grocery.

An example of one such receipt is:

Welcome to Sprouts Grocery
Tel: 09 67546
Vat No: 11782090

Item	Unit Price	Qty	Price(USD)
Carrots	2.00	2	4.00
Cabbage	0.40	0	0.00
Tomatoes	0.85	2	1.70
TOTAL PRICE		5.70	
TOTAL PAID	6.00		
Change	0.30		

Thank you for shopping at Sprouts Grocery!
Please Call Again! [25]

**********END OF PAPER **********