# MANICALAND STATE UNIVERSITY OF APPLIED SCIENCES

## FACULTY OF ENGINEERING, APPLIED SCIENCES AND TECHNOLOGY

**DEPARTMENT: COMPUTER SCIENCE AND INFORMATION SYSTEMS**

**MODULE: PRINCIPLES OF COMPUTER PROGRAMMING**

**CODE: INSY103/BCOS112**

**SESSIONAL EXAMINATIONS**
**DECEMBER 2023**

**DURATION: 2 HOURS**

**EXAMINER: Dr C. KURANGA**

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***INSTRUCTIONS***

1. *Answer **Question 1** and **any other three** questions*
2. *Start a new question on a fresh page*

***Additional material(s):*** *None*

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**Question 1**

a) The Pay As You Earn (PAYE) system is a method of paying Income Tax on remuneration. The employer deducts tax from your salaries or pension earnings before paying you the net salary or pension.

The official tax table operates on an escalating scale basis, (i.e. the higher your earnings, the greater percentage tax you pay on each bracket of earnings). When your earnings reach a certain amount, the percentage stops increasing and a flat rate of tax becomes applicable for any earnings above this level - that is Marginal Tax Rate (MTR).

The tax-free threshold for individual taxpayers $300.00.

The rate of tax for individual taxpayers who earns remuneration of above $20 001.00 per month is 50%

Consider the Zimbabwe Revenue Authority pay as you earn (paye) forex table for January to December 2022 and show how you can come up with a program that will calculate the income tax of an individual.

i) State the input and output of this problem. [2]

ii) State the formula involved. [2]

iii) Give the detailed algorithm for this problem. [6]

iv) Write a program that implements your algorithm. [10]

b) Differentiate a pseudo code from an algorithm. [4]

c) With the aid of examples, describe:

(i) logic errors; [4]

(ii) runtime errors; and [4]

(iii) design errors. [4]

d) Explain an event driven programming paradigm. [4]

**Question 2**

a) Create the equivalent of a four-function calculator. The program should request the user to enter a number, an operator and another number. It should then carry out at the specified arithmetical operation: addition, subtraction, multiplication or dividing the 2 number. (It should use a switch statement to select the operator). Finally, it should display result.

When its finishes the calculation, the program should ask if the user want to do another calculation. The response can be "yes" or "no". [11]

b) Explore three flow control structures. [9]

**Question 3**

a) Discuss different ways of type conversion.

[8]

b) Write C program to swap values of two integers without using third variable and give flow chart for the same. [12]

**Question 4**

a) Use a one-dimensional array to solve the following problem: A company pays its salespeople on a commission basis. The salespeople receive $200 per week, plus 9% of their gross sales for that week. For example, a salesperson who grosses $5000 in sales in a week receives $200 plus 9% of $5000, or a total of $650. Write a program (using an array) that determines how many of the salespeople earned salaries in each of the following ranges (assume that each salesperson's salary is truncated to an integer amount):

i) $200–$299

ii) $300–$399

iii) $400–$499

iv) $500–$599

v) $600–$699

vi) $700–$799

vii) $800–$899

ix) $900 and over [10]

b) Explore skills required for programming. [10]

**Question 5**

a) Explore any four data types. Illustrate how they can be declared and mention their uses. [8]

a) Write a program to compute examination grades based on the percentage of marks of three subjects. Read marks of three subjects and display the grade. Use the following criteria to calculate grade. [12]

| Marks | Grade |
|---|---|
| >=75 | Distinction |
| >=60 | Second Class |
| >=50 | Pass Class |
| Otherwise | Fail |

**Question 6**

a) A customer in a store is purchasing 5 items. Write a program that asks for the price of each item and then displays the subtotal of the sale, the amount of sales tax and the total. Assume the sales tax is 7%. [12]

b) Write a program that uses nested loops to draw this pattern:

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[8]

**END OF EXAMINATION**