



**THE UNIVERSITY OF THE WEST INDIES
FIVE ISLANDS CAMPUS**

Semester II

Examinations of April/May 2023

Course Code: COMP0002
Course Title: Preliminary Computer Science II
Date of Assessment: 25th April 2023
Time: 1:00 pm
Duration: Two (2) Hours

INSTRUCTIONS TO CANDIDATES:

This paper has 6 pages and 7 questions.

YOU ARE REQUIRED TO ANSWER ALL QUESTIONS.

THIS ASSESSMENT IS WORTH 50% OF YOUR FINAL GRADE.

ASSESSMENT DETAILS FROM INSTRUCTOR: Please answer all questions on this paper showing all relevant working. Non-Graphing calculators are allowed.

1.

- a. Differentiate between encapsulation and abstraction in software design. **(2 marks)**
- b. Explain the purpose of Big O notation. What is the runtime complexity for the binary search algorithm? What is the runtime complexity for a linear search algorithm? Which algorithm is faster? **(5 marks)**
- c. Consider the following array with six integers

Location	0	1	2	3	4	5
Value	9	9	6	3	7	-4

Use a bubble sort (ascending order) to show the contents of the array for each of the first five passes of the sort. **(5 marks)**

2.

Based on the code given below, generate a UML diagram: **(8 marks)**

```
class BankAccount:

    def __init__(self, account_number, account_balance, account_holder_name):
        self.__account_number = account_number
        self.__account_balance = account_balance
        self.__account_holder_name = account_holder_name

    def deposit(self, amount):
        self.__account_balance += amount

    def withdraw(self, amount):
        if self.__account_balance >= amount:
            self.__account_balance -= amount
        else:
            print("Insufficient funds")

    def get_balance(self):
        return self.__account_balance

    def print_account_holder_name(self):
        print(self.__account_holder_name)
```

3. What is the runtime complexity of the following pieces of code: (2 marks each)

a.

```
def find_intersection(lst1):
    for x in lst1:
        total = 0
        for y in lst1:
            total += x*y
        return total

    return -1
```

b.

```
def find_max(lst):
    if not lst:
        return None
    max_elem = lst[0]
    for elem in lst:
        if elem > max_elem:
            max_elem = elem
    return max_elem
```

c.

```
def sum_pairs(lst):
    print("Length of list:", len(lst))
    return -1
    for i in lst:
        for j in lst:
            print(i + j)
    return lst

print(sum_pairs([0,1,2,3]))
```

4.

- a. Explain TWO attributes of well-engineered software. **(4 marks)**
- b. A software system that is to be developed has the following properties:
- It has clear requirements.
 - It has a fixed budget.
 - The number of requirements is small.
 - It is being developed for an environment that is stable and does not change.

What software process model would you use to develop such a system? Justify the selection of the software process model as opposed to at least ONE other software process model.

(4 marks)

- c. What is meant by black box testing? **(2 marks)**
- d. In the evolutionary phase of the software development lifecycle, outline at least two problems that may arise. **(2 marks)**

5. Create a context diagram (Level-0 Data Flow Diagram) for a Food Delivery System described below: **(8 marks)**

The system presents the customer with a list of food options. The customer selects the food they desire to order. The system sends them a message to confirm their order. The customer can confirm the order. If they confirm that the order is correct, they can then proceed to payment. The system will request payment and delivery details from the customer, and the customer will then provide these details. The system will confirm that payment has been received. Upon completion of the preparation of the food, a driver will be notified about the pickup and drop-off details for the food. Upon delivery of the food, the driver will notify the system that the food has been delivered. The system will then send a thank you notice to the customer. At any point in this process before the customer pays, they can request to cancel the order. If a customer cancels the order, the system will request confirmation for the cancellation. The customer can then confirm their cancellation request.

6. The following provides details for a stock trading system. Create an entity relationship diagram to represent the scenario below. On your diagram, define ALL relationships, entity participation and cardinalities in BOTH directions. **(6 marks)**

Each Trader has one portfolio. A portfolio consists of zero or more stocks. Stocks must be recorded with the following: stockSymbol(primary key), portfolioID, purchasePrice, purchaseDate, lastClosingPrice, quantity

7.

- a. What is the purpose of an Operating System? **(2 marks)**
- b. Describe how virtual memory works. **(2 marks)**
- c. Why do modern computers use virtual memory? **(2 marks)**
- d. Compared to RAM, explain the disadvantage of using virtual memory. **(2 marks)**

END OF QUESTION PAPER