



UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER II
SESSION 2023/2024

- COURSE NAME : DATA STRUCTURE AND ALGORITHM
- COURSE CODE : BBP 25203
- PROGRAMME CODE : BBF
- EXAMINATION DATE : JULY 2024
- DURATION : 2 HOURS 30 MINUTES
- INSTRUCTIONS :
1. ANSWER ALL QUESTIONS
 2. THIS FINAL EXAMINATION IS CONDUCTED VIA
 - Open book
 - Closed book
 3. STUDENTS ARE **PROHIBITED** TO CONSULT THEIR OWN MATERIAL OR ANY EXTERNAL RESOURCES DURING THE EXAMINATION CONDUCTED VIA CLOSED BOOK

THIS QUESTION PAPER CONSISTS OF **FOUR (4)** PAGES

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PART A

Q1 C++ floating-point notation refers to the representation of real numbers in a binary format within a computer's memory.

- (a) Explain the significance of the "float" and "double" data types in C++ floating-point notation.

(2 marks)

- (b) Convert the following real number to its equivalent representation in C++ floating-point notation.

(i) 75.924

(ii) 0.18

(iii) 0.0000453

(iv) -1.482

(4 marks)

- (c) Differentiate between the float and double data types in C++ with respect to their precision, range, and memory consumption.

(6 marks)

- (d) Write a C++ program that calculate the following floating points expression in **Figure Q1.1**.

$5.0 + 3.5 = 8.5$
$3.0 + 9.4 = 12.4$
$16.3 - 5.2 = 11.1$
$4.2 * 2.5 = 10.5$
$5.0 / 2.0 = 2.5$
$34.5 / 6.0 = 5.75$

Figure Q1.1

(8 marks)

Q2 In C++, an array is a collection of elements of the same data type stored in contiguous memory locations. These elements can be accessed using an index. Arrays provide a convenient way to store and manipulate multiple values of the same type under a single name.

- (a) Define an array named `scores` of type integer to store the scores of 5 students.

(2 marks)

- (b) Discuss the difference between declaring and initializing an array in C++ by providing examples of both declaration and initialization of arrays.

(6 marks)

- (c) Write a general form syntax for:
- (i) accessing array components
 - (ii) storing array components
- (4 marks)
- (d) Write a C++ function named `sumArray` that takes an array of integers and its size as parameters and returns the sum of all elements in the array. Provide a code example demonstrating the usage of this function.

(8 marks)

Q3 Searching is finding a specific element within a data structure, such as an array, vector, or container.

- (a) Describe how sequential searching locates a target element within an array.
- (2 marks)
- (b) List six (6) steps on how sequential searching works.
- (6 marks)
- (c) Given a sorted array of size 100, calculate the average number of comparisons needed to find an element using:
- (i) binary searching
 - (ii) sequential searching
- (4 marks)
- (d) Consider the sorted array of integers in **Figure Q3.1**.

`[10, 20, 30, 40, 50, 60, 70, 80]`

Figure Q3.1

Perform binary searching to find the index of the element 50 in the array. Show each step of the binary searching process, including comparing elements and dividing the search interval.

(8 marks)

Q4 A queue is a linear data structure that follows the First-In-First-Out (FIFO) principle. It is similar to a queue of people waiting in line, where the first person to join the line is the first one to be served.

(a) State four (4) basic queue operations. (2 marks)

(b) Describe how elements are added to and removed from a queue. (4 marks)

(c) Provide three (3) examples of queue concepts in data structure related to computer systems. (6 marks)

(a) You are developing a simulation program to model a supermarket checkout system. Explain how you would use a queue data structure in C++ to represent the line of customers waiting to check out by considering enqueue customers entering the line and dequeue customers as the cashiers serve them. (8 marks)

Q5 Sorting in C++ refers to the process of arranging elements of a collection in a specific order, typically in ascending or descending order.

(a) List two (2) types of sorting in data structure. (2 marks)

(b) Consider the list given in **Figure Q5.1**. Explain the step-by-step process of sorting the listed numbers using selection sort.

13	56	77	34	21	25	32
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Figure Q5.1

(10 marks)

(c) Write a C++ program to sort the list in **Figure Q5.1** using selection sort. (8 marks)

- END OF QUESTIONS -