National College of Ireland

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BSc. (Hons) in Computing – Fulltime – BSHCIFSC2
Higher Cert in Computing – Fulltime – HCCOMP2
BSc. (Hons) in Computing – Parttime – BSHCE2
Higher Cert in Computing – Parttime – HCCOMPE2

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Data Structures & Algorithms

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SAMPLE

Answer all Questions required in the exam booklet.
The question paper must be returned with the exam booklet,

Duration of exam: 2 hours

All 14 questions to be answered in exam booklet **100 marks Total**

1. Explain and show the state of an initially empty queue after each of the following operations on it: enqueue(“apple”), enqueue (“orange”), enqueue(“melon”), front( ), dequeue( ) , dequeue( )

[5 marks]

2. Consider that you have an ArrayList type object that stores Book data. Provide Java code to do the following:
    A. to remove the book “Intro to Java”, at the first position of the ArrayList
    B. to print out the element at the last position of the ArrayList storing the book information.

[5 marks]

3. Explain the principle of insertion and removal performed on the stack abstract data type.

[5 marks]

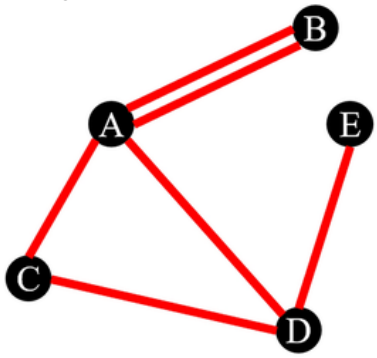
4. Provide the Java code for the print method of a single linked list.

[5 marks]

5. Explain using a diagram the steps required to add a new node into position X in a double linked list where X is the first position.

[10 marks]

6. What type of graph is represented below? Provide the adjacency matrix.

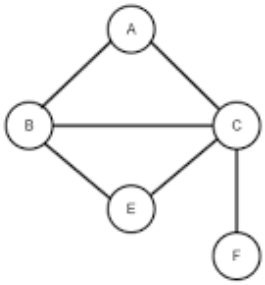


[5 marks]

7. Name 4 types of graphs.

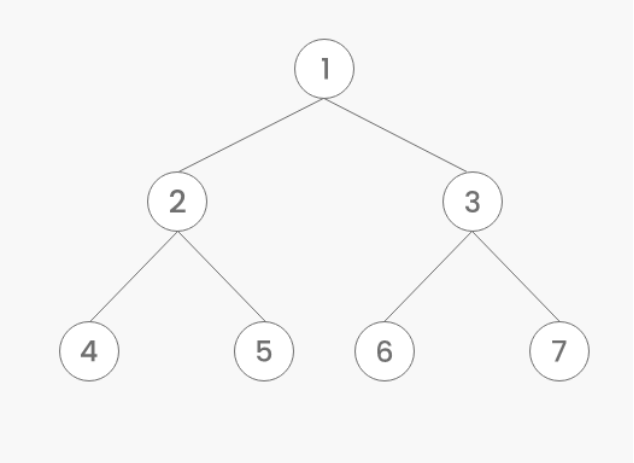
[5 marks]

8. Create the adjacency matrix of the following graph.



[5 marks]

9. Consider the following binary tree:



A. What is the print out of post-order traversal?

[10 marks]

10. Explain 2 key differences between a singly vs doubly linked list.

[10 marks]

11. For the array of {5, 4, 3, 2, 1} perform a step-by-step linear search for 3.

.

[10 marks]

12. Give a brief explanation of Big O and include 3 constant time examples.

[10 marks]

13. What is the Big O time complexity of the following code? Explain why.

```
i=1;
sum = 0;
while (i <= n) {
    j=1;
    while (j <= n) {
        sum = sum + i;
        j = j + 1;
    }
    i = i +1;
}
```

[2 x 5 marks]