# UTHM
Universiti Tun Hussein Onn Malaysia

# UNIVERSITI TUN HUSSEIN ONN MALAYSIA

## FINAL EXAMINATION
## (ONLINE)
## SEMESTER II
## SESSION 2019/2020

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|---|---|---|
| COURSE NAME | : | DATA STRUCTURE & ALGORITHM |
| COURSE CODE | : | BBP 25203 |
| PROGRAMME CODE | : | BBF |
| EXAMINATION DATE | : | JULY 2020 |
| DURATION | : | 3 HOURS |
| INSTRUCTION | : | ANSWER **FIVE (5)** QUESTIONS ONLY. |

THIS QUESTION PAPER CONSISTS OF **FIVE (5)** PAGES

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BBP 25203

Q1 Algorithm is a step-by-step problem-solving process in which a solution is arrived at in a finite amount of time.

(a) List five (5) steps problem-solving process that you had learned.

(5 marks)

(b) Explain three (3) data types categories in C++.

(6 marks)

(c) Briefly explain built-in and user-defined data type.

(4 marks)

(d) Write an algorithm to calculate the perimeter and the area of a triangle.

(5 marks)

Q2 (a) Give the definition of the following terms:
    (i) Arrays
    (ii) Stacks

(5 marks)

(b) Write two statements you can use to declare a four-element double array, initializing each element to be double number 0.0.

(4 marks)

(c)

```
#include<iostream>
using namespace std;

main(int)
{
        short hours[5];
        int count;

        cout << "Enter the hours worked by six employees.\n";
        for (int count=1; count<=5; count++)
        {
                cout << "Employee " << count << ":";
                cin >> hours[count-1];
        }
        cout << "The hours you entered are\n";
        for (count =1; count<=5; count++)
        {
                cout << "Employee "<< count << ":";
                cout << hours[count-1] << endl;
        }
}
```

Figure 1

Based on the program given in Figure 1, give the output.
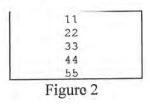
(6 marks)

2

(d) Produce a simple array program index starts with 0, which means the first array element is at index 0, second is at index 1 and so on until index 4 that will produce output as in Figure 2.

```
11
22
33
44
55
```

Figure 2

(5 marks)

Q3 (a) Define the term linear search and binary search.

(5 marks)

(b) Based on the binary search program in Figure 3, give the example of the output.

```
#include<iostream>
using namespace std;

int main()
{
    int search(int [],int,int);
    int n,i,a[100],e,res;
    cout<<"How Many Elements:";
    cin>>n;
    cout<<"\nEnter Elements of Array in Ascending order\n";
        for(i=0;i<n;++i)
        {
        cin>>a[i];
        }

        cout<<"\nEnter element to search:";
        cin>>e;
        res=search(a,n,e);

    if(res!=-1)
        cout<<"\nElement found at position "<<res+1;
    else
        cout<<"\nElement is not found....!!!";
    return 0;
}
 int search(int a[],int n,int e)
{
    int f,l,m;
    f=0;
    l=n-1;

    while(f<=l)
    {
        m=(f+l)/2;
        if(e==a[m])
            return(m);
        else
            if(e>a[m])
                f=m+1;
            else
                l=m-1;
    }
    return -1;
}
```

Figure 3

(5 marks)

3

(c) Using C++, write a binary tree with a node type.

(5 marks)

(d) Given an array arr[] of n elements, write a function to search a given element x in arr[] that produce the sample output as in Figure 4.

```
Input : arr[] = {2,3,4,10,40}
            x = 10;
Output :
        Element x is present at index 3
```

Figure 4

(5 marks)

Q4 (a) List five (5) basic operations performed on a queue.

(5 marks)

(b) Explain queue and priority queue.

(4 marks)

(c) By using diagram, explain queue operation using array.

(6 marks)

(d) Given the key value={10, 15, 30, 45, 50, 60, 100}, draw:

(i) Min-heap tree
(ii) Max-heap tree

(5 marks)

Q5 (a) State the definition of bubble sort and heap sort.

(5 marks)

(b) Given the set of elements= {5 1 4 2 8}, explain the first pass bubble sort and second pass bubble sort.

(10 marks)

(c) Assume list is an array of n elements and assume that swap function swaps the values of the given array elements, write a bubble sort algorithm.

(5 marks)

BBP 25203

Q6  (a)  Give the difference between divide and conquer process in quick sort.

(5 marks)

(b)  Given an array (Figure 5) which needs to be sorted using quick sort algorithm.

| 4 | 2 | 6 | 5 | 3 | 9 |

Figure 5

Explain each steps of the process involve in quick sort if the pivot=5.

(10 marks)

(d)  Produce the steps involved in quick sort algorithm.

(5 marks)

**-END OF QUESTIONS-**

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