NATIONAL SCHOOL OF BUSINESS MANAGEMENT

BSc. In Management Information Systems (Special) – 20.2

BSc. (Honours) in software Engineering – 20.2

BSc. (Honours) in Computer Science – 20.2

BSc. (Honours) in Computer Networks – 20.2

BSc (Hons) Software Engineering (PU) – 20.2

BSc (Hons) Computer Networks (PU) – 20.2

BSc (Hons) Computer Security (PU) – 20.2

1st Year 2nd Semester Examination

12th July 2021

CS106.3 – Algorithms & Data Structures

Instructions to Candidates

1) Answer ALL questions
2) Time allocated for the examination is three (03) hours and 30 minutes (Including downloading and uploading time)
3) Weightage of Examination: 60% out of final grade
4) Download the paper, provide answers to the questions in a word document.
5) Answer script should be uploaded in PDF Format.
6) The Naming convention of the answer script – Module Code_Subject name_Index No
7) Please upload the document with answers (Answer Script) to the submission link before the submission link expires.
8) Under any circumstances E-mail submissions would not be taken into consideration for marking. Incomplete attempt would be counted as a MISSED ATTEMPT.
9) You must adhere to the online examination guidelines when submitting the answer script to N-Learn.
10) Your answers will be subjected to Turnitin similarity check, hence, direct copying and pasting from internet sources, friend's answers etc. will be penalized.
11) Google diagrams, images are not allowed in the answers.

Answer All the Questions.

Question 1: Searching Algorithms [20 Marks]

1. Define the difference between Linear search and Binary search algorithms. [3 Marks]
2. Show the graphical representation of the Binary Search algorithm to search the position of value 59 in the following data set [15,33,45,56,59,68,84]. [6 Marks]
3. Write down a source code to implement the Linear Search function. (Can use pseudo-code or C language). [5 Marks]
4. Find out errors in the following code snippet, if any, and rewrite the code while improving its efficiency. Note (f= first , l = last , m = mid) [6 Marks]

```
int binarySearch(int arr[], int f, int l, int x)
{
    while (l <= f) {
        int m = (f+l) / 2;

        if (arr[m] == x)
            return m;

        if (arr[m] < x)
            f = m - 1;

        else
            l = m + 1;
    }

    return -1;
}
```

Question 2: Stack and Queue [20 Marks]

1. Graphically show the steps to insert your first name into a stack character by character. [4 Marks]
2. Imagine the same dataset featured in a queue. Graphically show the function POP three times of the queue. [4 Marks]
3. Write down the code snippets to implement functions push() and pop() in a queue. (Can use pseudo-code or C language). [4 Marks]
4. Write down a recursive function to find the factorial of a number. [4 Marks]

   Factorial of n = n* (n-1)* (n-2)…… 1

   Ex: 5! = 5*4*3*2*1 = 120

5. Evaluate the Big O notation for the following code. (Clearly show your workings)

[4 Marks]

```
#include <stdlib.h>

int main()
{
    int x=0;
    int y=0;
    int data[5]={12,53,63,96,47,22,75};

    for(x=0;x<5;x++){
        for(y=0;y<X;y++){
            temp = data[y];
            data[y]=data[y+1];
            data[y+1]=temp;
        }
    }
    for(x=0;x<5;x++){
          printf("Dataset arrangement %d",data[x]);
    }

    return 0;
}
```

Question 3: Sorting Algorithms [20 Marks]

1. Sort the following dataset using Selection Sort Algorithm. Clearly state iteration numbers and data swapping steps. [4 Marks]

   [56, 23, 89, -9, 36, 74, 250, 1]

2. Write the function to implement Bubble Sort algorithm. (Can use pseudo code or C language). [4 Marks]

3. Graphically show how merge sort will executes the following data set sorted step by step. [6 Marks]

11	53	89	-8	0	-78	954	3	15	11

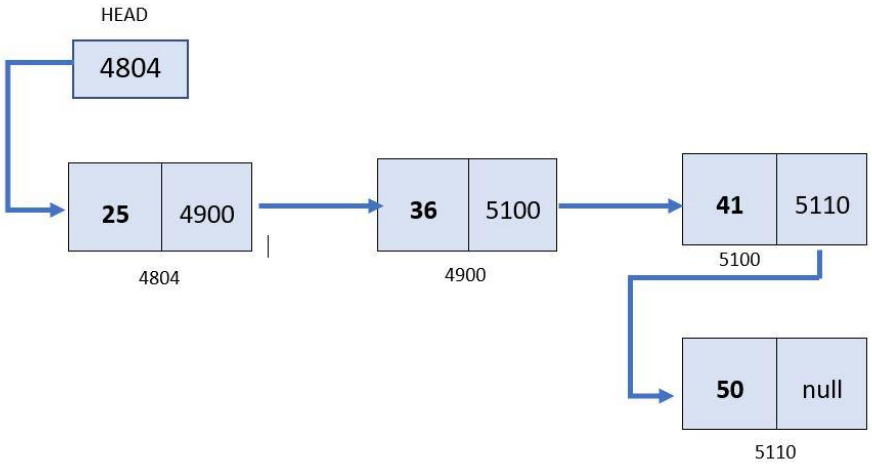
4. Following incomplete code snippet is to implement insertion sort algorithm. Rewrite the code while filling the missing parts and insert comment lines for each code line explaining its functionality. [6 Marks]

```
void insertionSort(int arr[], int n)
{
    int i, key, j;
    for (i = 1; i < n; i++) {
        key = arr[i];
        j = .......;

        while (.......... && ......... > key) {
            arr[j + 1] = arr[j];
            j = j - 1;
        }
        arr[j + 1] = .......;
    }
}
```

Question 4: Linked Lists & Structures [20 Marks]

1. Consider the following linked list and answer the following questions. [12 Marks]



a) Draw the graphical representation for the following options.

b) Insert Node 4850 in-between node 4804 and Node 4900.

c) Insert Node 5115 to the end of the linked list.

d) Delete Node 4804.

2. Saman is an owner of a car sale. He wants a model to store few common characteristics of all the cars he owns. Saman wants to store the make, model, chasino, weight, enginecpy, color. [8 Marks]

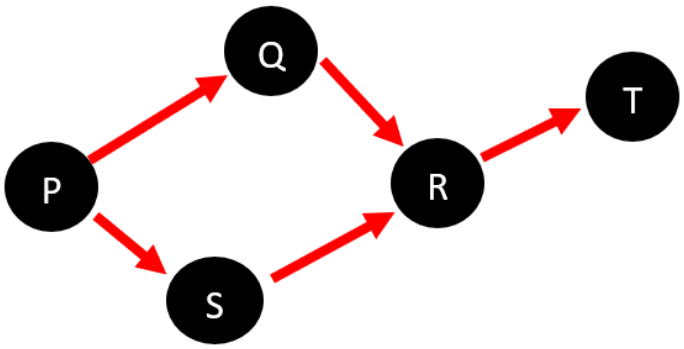
Ex: CAR 1 Toyota Corolla EN452362 658.5 1500 white

Tasks:

a) Write down a structure to implement the model Saman required.
b) Assign one car detail to an instance of that structure.

Question 5: Binary Search Tree [20 Marks]

1. Describe the difference between the linear data structures and hierarchical data structures. [3 Marks]
2. Draw the Binary Tree for the following dataset [6, 13, 4, 5, 27, 22, 2, 0, 50, 31, 1]. [6 Marks]
3. Write down the three Travel Procedures for the above Binary Tree. [3 Marks]
4. Write down the BFS and DFS order while drawing Spanning Trees. [8 Marks]



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