



# United International University (UIU)

Dept. of Computer Science and Engineering (CSE)

Mid Exam Year: 2022

Trimester: Spring

Course: CSE 2215/CSI 217 Data Structure and Algorithms I

Total Marks: 30, Time: 1 hour 45 min

(Any examinee found adopting unfair means will be expelled from the trimester / program as per UIU disciplinary rules)

There are **FOUR** questions. Answer all of them. Figures in the right-hand margin indicate full marks.

1. a) How do the ascending order Merge Sort algorithm and Quick Sort algorithm (upto first partition) work on the following data? [5]

y p z x r s

Here,  $x$ =last two digits of your student id+1,  $y=x+3$ ,  $z=x+y$ ,  $p=y+z$ ,  $r=x+2$ ,  $s=y+9$

- b) Discuss the time complexity of the following algorithm. [2]

```
sum=0;
for(i=1; i<=n; i++){
    for(j=1; j<=i; j++){
        sum=sum+i+j;
    }
}
printf("%d", sum);
```

2. a) Find the memory location of  $A[15][20]$  if  $\text{loc}(A[5][10])=8000+c$ , where  $c$ =last four digits of your student id. Assume row-wise memory is allocated in the double array  $A[50][60]$ , where each double data is 8 bytes. [3]

- b) How does the Binary Search algorithm work for the following data? Also find the total number of element comparisons needed in this case. [3]

Input Data: t r p z y x

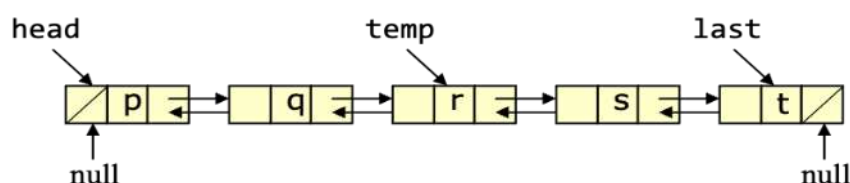
Search Key=y

Here,  $x$ =last two digits of your student id,  $y=x+3$ ,  $z=x+y$ ,  $p=y+z$ ,  $r=z+p$ , and  $t=p+r$

- c) If  $f(n)=kn^2-3$ , prove that  $f(n)=O(n^2)$ . Here,  $k$ =last digit of your student id+2. [2]

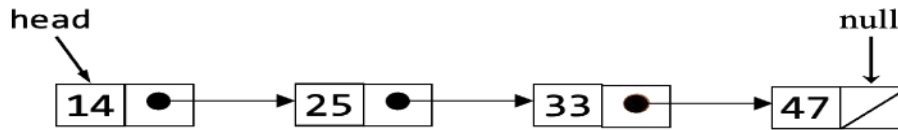
3. a) Answer the following questions for the doubly linked list as shown below, where  $p$  = last two digits of your student id + 7,  $q = p+4$ ,  $r = p+q$ ,  $s = r-3$ ,  $t = r+s$ . [3]

- head  $\rightarrow$  next  $\rightarrow$  next  $\rightarrow$  value = ?
- last  $\rightarrow$  prev  $\rightarrow$  next  $\rightarrow$  value = ?
- temp  $\rightarrow$  prev  $\rightarrow$  prev  $\rightarrow$  prev = ?
- temp  $\rightarrow$  next  $\rightarrow$  prev  $\rightarrow$  prev  $\rightarrow$  value = ?
- last  $\rightarrow$  prev  $\rightarrow$  prev  $\rightarrow$  next  $\rightarrow$  value = ?



b) Assume that you are given a single linked list as shown below. Write the statements to perform the following: [5]

- i) To insert 40 in between 33 and 47.
- ii) To delete 14 from the list.
- iii) To make a linear circular linked list from the current list.



4. a) Show the status of a STACK implemented by a linear linked list for the operations given below. Here,  $x = \text{last digit of your student id} + 5$ ,  $y = x + 3$ , and  $z = y + x$ . [2]

Push( $x+y$ ), Push( $y+z$ ), Pop(), Push( $y*z$ ), Push( $x*y$ ), Pop(), Pop()

b) Show the effect of each the statements given in the following code using a Stack. [3]

```

#include<stdio.h>
#include<string.h>
int top=-1;
char Stack[4]={'\0'};
int main(){
    char Str1[4]={'\0'};
    char Str2[4]={'\0'};
    int i;
    strcpy(Str1, "CSE");
    for(i=0; i<3; ++i){
        Push(Str1[i]);
    }
    for(i=0; i<3; ++i){
        Str2[i]=Pop();
    }
    printf("%s", Str2);
    return 0;
}

```

```

void Push(char x){
    Stack[++top]=x;
    return;
}

```

```

char Pop(void){
    return Stack[top--];
}

```

c) Write an algorithm to display the data stored in a double linked list in reverse order. Assume only head pointer is given for the linked list. [2]