



United International University (UIU)
Dept. of Computer Science and Engineering (CSE)
Mid Exam Year: 2022 Trimester: Fall
Course: CSE 2215/CSI 217 Data Structure and Algorithms-I
Total Marks: 30, Time: 1 hour 45 minutes

(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 does the **Descending Order Merge Sort** work on the following data? [3]
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. [3]
sum=0;
for(i=1; i<=n; i++){
for(j=1; j<=i; j++){
sum=sum+i+j;
}
}
printf("%d", sum);
2. a) How many times the condition of while loop in the **Ascending Order Insertion Sort Algorithm** will be executed for the following data? [3]
Data Set-I: 10, 20, 30, 40
Data Set-II: 40, 30, 20, 10
Data Set-III: 30, 10, 40, 20
- b) How many element comparisons are needed for the following instance of the **Ascending Order Quick Sort Algorithm** to find the first partitioning element? [2]
18 23 56 26 89 37 28 48
- c) Find the memory location of $A[60][70]$ if $\text{loc}(A[15][20])=x+1200$, where x =last four digits of your student ID. Assume column-wise memory is allocated in the floating point type array $A[80][100]$, where each float data is 4 bytes. [2]
3. a) How does the **Binary Search Algorithm** work on the following data? [2]
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 $t=p+r$
- b) If $f(n)=kn^2-5$, prove that $f(n)=\Theta(n^2)$. Here, k =last digit of your student id+2. [3]
- c) Suppose a linear linked list headed with "start" contains four nodes whose data values are 10, 20, 30, 40, respectively. Show the following operations. [4]
i) Draw a diagram for the linked list.
ii) Find a name for each of the nodes with respect to "start" that contain 10, 20, 30, 40, respectively?

- iii) Write statements to represent 10, 20, 30, 40, respectively.
 iv) Write a statement to set NULL at the end of the linked list

4. a) Show the effect of each of the statements given in the following code segment. [4]
 Assume, each of the nodes in the linear linked list has two fields' **data** and **next**, where **data** is of integer type and **next** will contain the address of the next node.

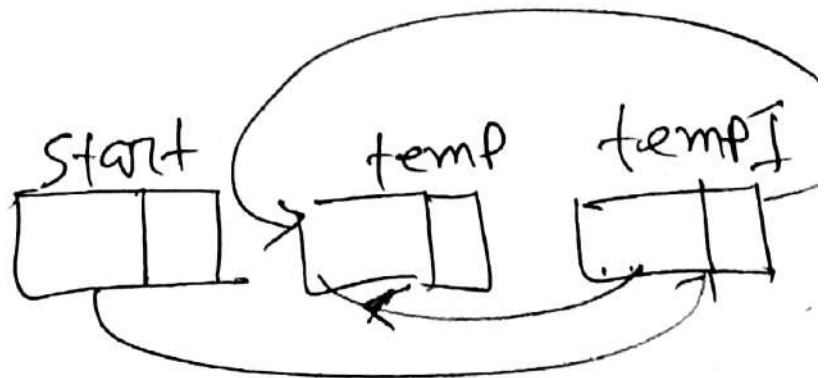
```
start=(node*)malloc(sizeof(node));
temp=(node*)malloc(sizeof(node));
temp1=(node*)malloc(sizeof(node));
start->data=10;
temp->data=40;
temp1->data=30;
start->next=temp1;
start->next->next=temp;
temp->next=NULL;
start->next=temp1->next;
free(temp1);
newitem=(node*)malloc(sizeof(node));
newitem->data=34;
newitem->next=start->next;
start->next=newitem;
```

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

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

- c) Show the status of a QUEUE of size 3 implemented by an array for the operations [2]
 given below. Here, $x = \text{last digit of your student id} + 5$, $y = x + 3$, and $z = y + x$. Here, Enqueue
 and Dequeue are meant by insertion and deletion, respectively.

Enqueue($x+y$), Enqueue($y+z$), Dequeue (), Enqueue($y*z$), Enqueue($x*y$), Dequeue ()



$$\frac{n^2 + n + 2n}{2}$$