United International University (UIU)

Dept. of Computer Science and Engineering (CSE)

Mid Exam Year: 2022 Trimester: Summer

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.

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1. a) How does the ascending order Merge Sort algorithm 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=2; i<=n; i++){
   for(j=2; j<=i; j++){
        sum=sum+i+j;
    }
 }
 printf("%d", sum);
```

2. a) Find the memory location of A[40][70] if loc(A[15][20])=8000+w, where w=last four digits of your student id. Assume row-wise memory is allocated in the double array A[80][100], 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

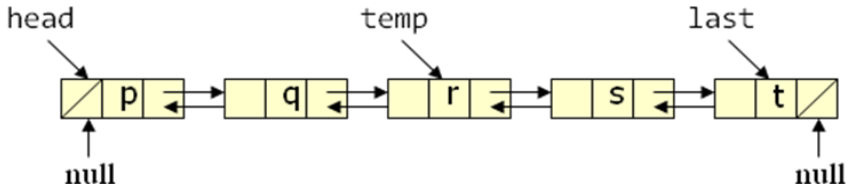
   Search Key=y

   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-5, prove that f(n)=Θ(n). Here, k=last digit of your student id+4. [2]

3. a) Answer the following questions for the doubly linked list as shown below, where p = last two digits of your student id + 9, q = p+4, r = p+q, s = r-3, t = r+s. [3]

   a) head –> next –>next-> value = ?
   b) last –> prev –> next->value = ?
   c) temp –> prev –> prev –> prev= ?
   d) temp –> next–> prev –>prev->value = ?
   e) last –> prev –> prev –>next-> value = ?



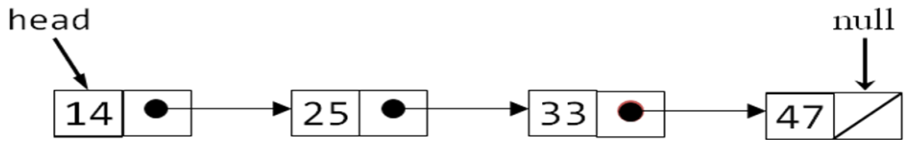
   b) Assume that you are given a single linked list as shown below. Write the statements [4]

to perform the following:

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=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 of the statements given in the following code segment. Assume, each of the nodes has two fields' data and next, where data is of integer type and next will contain the address of the next node. [3]

```
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;
```

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]

d) Show the status of a QUEUE of size 3 implemented by an array for the operations given below. Here, x=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. [2]

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