Module 28: Theory Midterm Exam

1. Calculate the time complexity of the following code snippets. **3.33*3=10**

(a)
```
for(int i =1; i<n; i=i*2){
     p++;
}
for(int j=1; j<p; j=j*2){
     printf("hello");
}
```

(b)
```
for(int i =1; i*i<n; i++){
     printf("hello");
}
```

(c)
```
for(int i =1; i<n; i=i*2)
{
   for(int j=1; j<i; j++){
      printf("hello");
   }
}
```

2. Write down all the steps of **Counting Sort** on the Following Array.
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Index	0	1	2	3	4	5	6	7
Value	3	3	1	7	7	4	4	5

3. Find ‘4’ in the following array using Binary Search and show the steps. Draw the Binary Search Tree for the given Array using the Binary Search technique.
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Index	0	1	2	3	4	5	6	7	8	9

Value	1	2	4	9	12	14	16	21	32	35

4. Assume a 2D array is declared as **`int arr[70][65].`** The value of the base address of the array is **`arr[0][0] = 1230.`** `Find out the location of` **`arr[3][18].`** **(**An Integer is a word addressable (4 bytes) datatype)

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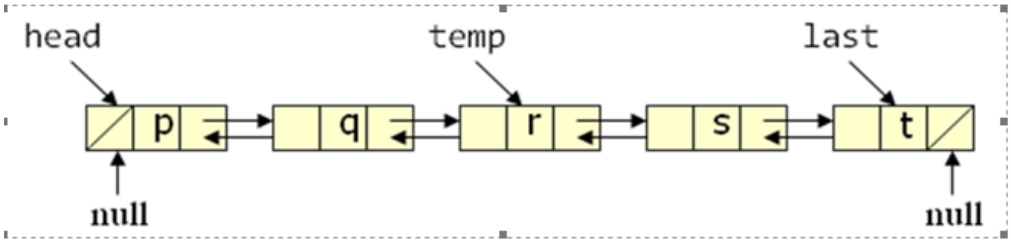
5. Answer the following questions for the doubly linked list as shown below, where p = 12 , q = p+4, r = p+q, s = r-3, t = r+s.

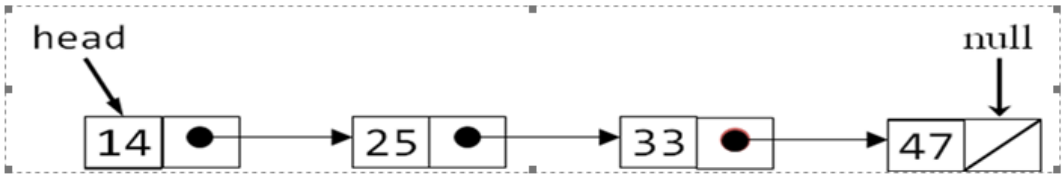
5*2=10

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 = ?



6. Assume that you are given a single linked list as shown below. Write the statements to perform the following:

3.33*3=10



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.

7. Write an algorithm to display the data stored in a doubly linked list in reverse order. Assume only the head pointer is given for the linked list.

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8. Show the status of a STACK implemented by a linear linked list for the operations given below. Here, x= Last day of your birthday + 5, y=x+3, and z=y+x.

1.4*7=10

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

9. Show the effect of each of the statements given in the following code using a Stack.

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```
#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--];}
```

10. What are the merits of implementing a QUEUE using Array in a circular fashion? How do you check the underflow and overflow in the QUEUE implemented circularly?

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11. Show the status of a QUEUE for the following operations, where the QUEUE is implemented by an array of size, m=3. Here, Enqueue and Dequeue mean insert and delete respectively, and x=9,, y=x+3, z=x+y, and p=y+z. **5**

Enqueue(z), Enqueue(p), Dequeue(), Enqueue(y), Enqueue(z)

12. Generate a pseudocode for solving the following problems within a time complexity of O(n^2)

Delete all of the consecutive elements from a Linear Linked List whose sum is equal to (Zero). **10**

Input	Output	Explanation
8 6 -6 8 4 -12 9 8 -8	9	6-6 = 0 8+4-12 =0 8-8 =0 Thus, all of these numbers from the list is eliminated
11 4 6 -10 8 9 10 -19 10 -18 20 25	20->25	4+6-10=0 8+10-18=0 9+10 = -19 Thus, all of these numbers from the list is eliminated