Time:2 hours **End Semester Exam: MTH409** **Full Marks 50**

The paper has NINE questions

CODE-A

1. Construct a binary tree for the algebraic expression

$$(a + (b - c * a)/(a + b) - c)/((a + b/c) * d - (a - b))$$

Hence find the corresponding prefix and postfix expressions. [4+2+2]

2. Write a recursive C function which accepts a +ve integer n as argument and returns the sum [4]

$$1 \cdot 2 + 2 \cdot 3 + 3 \cdot 4 + 4 \cdot 5 + \cdots + (n-1) \cdot n$$

3. Construct a structure variable *pt* which represents a point in Cartesian xy-plane. Using *pt*, construct a structure variable *tri* which represents a triangle in the xy-plane. Write a C function which accepts a triangle as argument and returns the perimeter of the triangle. [2+2+4]

4. Write a C program which reads a +ve integer n. It then calculates the sum of the integers between 1 and n which are divisible by either 3 or 6 but not by 12. [4]

5. Construct a completely fill binary tree for the array

$$4, 37, 49, 32, 33, 42, 38, 28, 27, 26, 25, 23$$

and identify the node(s) which violates the max-heap property. Pictorially explain the steps which are needed to make the binary tree a max-heap. [2+1+3]

6. Write a C program which reads a date as three integers representing day, month and year. It then prints the date of the next day. (Assume that the year is not a leap year). [6]

7. What is the output of the following C code? [1+2+2]

```
int main()
{
int a,b=4,c=4;
c++;
a=b>c?c:b;
printf("%d %d\n",a,c);
b=++a/c--;
printf("%d %d %d\n",a,b,c);
a *= ++b%c++;
printf("%d %d %d\n",a,b,c);
return 0;
}
```

8. What is the output of the following C code? [1+2+2]

```
int main(){
int **p,*q,a[10],i;
for(i=0;i<10;i++)
    a[i] = i+2;
p = (int **)calloc(4,sizeof(int *));
q = a+3;
for(i=0;i<4;i++)
    p[i] = q-i;
for(i=1;i<=3;i++)
    printf("%d ",q[i]);
printf("\n");
for(i=0;i<3;i++)
    printf("%d ",p[2][i]);
printf("\n");
for(i=0;i<4;i++)
    printf("%d ",p[2][i]-*(p[1]+i));
printf("\n");
return 0;}
```

9. Study the following C code and write down the output. [2+2]

```
typedef struct
    {
    float a;
    int i;
    }data;


int main(){
data *p,q;
float c=3.0;
int d=8;
q.i=3;
q.a=2.0;
p=&q;
p→i=d;
printf("%0.2f %d \n",p→a,q.i);
d=11;
p→a=c;
c=5.0;
printf("%0.2f %d \n",q.a,p→i);
return 0;}
```