

**[ Mathematics for Embedded Systems, MTTH ]**

ESE 1444

**LAB:1 (Part 2 & 3)**

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**Lab #1 – Part 2**

**Truncation Error**

**Write a C++ program proving that to approximate e 10.5 using Taylor series with an error**

**less than 10-12:**

**a) We will need at least 17 terms around a=0.**

**b) We will need only 17 terms around 10.**

**What do you conclude from these calculations?**

**Solution:**

#include <iostream>

#include <cmath>

using namespace std;

int main ()

{

double x,e, result,n,j,fact=1,v,i;

x = 10.5,e=2.7182;

cout<<"Enter the value of n: -";

cin>>n;

result = pow(e,x)\*pow(x,n+1);

{

for(i=1;i<=n;i++){

fact=fact\*i;

v=result/fact;

cout<<"N:-"<<n<< endl;

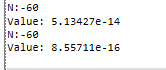
cout<< "Value: "<< v<< endl;

}

}

return 0;

}



**b.)**

#include <iostream>

#include <cmath>

using namespace std;

int main ()

{

double x,e, result,n=17,j,fact=1,v,i;

x = 10,e=2.7182;

cout<<"Enter the value of n: -";

cin>>n;

result = pow(e,x)\*pow(x,n+1);

{

for(i=1;i<=n;i++){

fact=fact\*i;

v=result/fact;

cout<<"N:-"<<n<< endl;

cout<< "Value: "<< v<< endl;

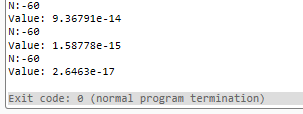
}

}

return 0;

}

Output:



**What do you conclude from these calculations?**

For convergence at a=0 a minimum of 17 terms should be taken into account to reduce the error or to minimize the value of error within a given range whereas for the same function with a convergence at a=10 ,we need only 17 terms to reduce the error upto the desired range as it has more negative value for n=16 and more positive for n=18.

**Lab #1 – Part 3**

**Taylor Series**

**Write a C++ program equivant to the following code to calculate the exact value for**

**ex=10 using Taylor series around a=0.**

#include <iostream>

#include <cmath>

using namespace std;

int fact(int n) {

if ((n==0)||(n==1))

return 1;

else

return n\*fact(n-1);

}

int main()

{

float x = 10, sum = 1, term = 1, temp = 0;

int i = 0;

while (temp != sum)

{

i++;

term = term \* x / i;

temp = sum;

sum = sum + term;

cout<<"Output:" <<i<<' '<<term<<' '<<sum<<endl;

}

// Rn = (exp((double)x)\* pow(10,i+1))/fact(i+1);

cout<< "Exact Value:"<<((double)x);

return 0;

}

**Output:**

