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***INSTITUTE OF INFORMATION TECHNOLOGY***

***JAHANGIRNAGAR UNIVERSITY***

**Lab Report :** 02

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**Course Tittle :** Numerical Analysis Lab

**Course Code :** ICT - 2106

**Submitted To Submitted By**

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IIT - JU

**Exercise 1.**

**Code:**

x=1;

sum1=0;

for n=0:1:4 %approximate upto 5 terms

m=(((-1)^n)\*(x^(2\*n)))/factorial(2\*n);

sum1=sum1+m;

end

sum1;

true\_value=cos(x);

absolute\_error=abs(true\_value-sum1);

relative\_error=absolute\_error/true\_value;

sum2=0;

for i=0:1:11 %approximate upto 12 terms

m=(((-1)^i)\*(x^(2\*i)))/factorial(2\*i);

sum2=sum2+m;

end

sum2;

absolute\_error=abs(true\_value-sum2);

relative\_error=absolute\_error/true\_value;

**Output:**

sum1 =

0.540302579365079

true\_value =

0.54030230586814

absolute\_error =

2.73496939540152e-07

relative\_error =

5.06192434438543e-07

sum2 =

0.54030230586814

absolute\_error =

1.11022302462516e-16

relative\_error =

2.0548182241075e-16

**Exercise 2.**

**Code:**

x=1;

sum=0;

sum1=cos(x); %true value

n=0;

while abs(sum1-sum)/sum1 > (0.5 \* 10^-8);

sum=sum+((-1)^n \* x^(2\*n))/(factorial(2\*n));

n=n+1;

end

N=n+1; %number of terms

N;

sum;

e=abs(sum1-sum)/sum1; %error at x=0.1

**Output:**

sum1 =

0.54030230586814

N =

7

sum =

0.540302303791887

e =

3.84276117786801e-09

The value of error at this point is 3.84276117786801e-09.

**Exercise 3.**

**Code:**

xi1=1; %value of x(i+1)

xi=0; %value of x(i)

h=xi1-xi;

f=cos(xi1);

f0=cos(xi);

syms x;

f=cos(x);

y=diff(f);

y\_val=vpa(subs(y,x,xi));

y1=diff(diff(f));

y1\_val=vpa(subs(y1,x,xi));

y2=diff(diff(diff(f)));

y2\_val=vpa(subs(y2,x,xi));

y3=diff(y2);

y3\_val=vpa(subs(y3,x,xi));

y4=diff(y3);

y4\_val=vpa(subs(y4,x,xi));

y5=diff(y4);

y5\_val=vpa(subs(y5,x,xi));

y6=diff(y5);

y6\_val=vpa(subs(y6,x,xi));

format shortg;

approximated\_value= f0+ h\*y\_val + ((h^2)/factorial(2))\*y1\_val + ((h^3)/factorial(3))\*y2\_val + ((h^4)/factorial(4))\*y3\_val + ((h^5)/factorial(5))\*y4\_val + ((h^6)/factorial(6))\*y5\_val + ((h^7)/factorial(7))\*y6\_val;

maximum\_error= cos(xi1)-approximated\_value;

previous\_error=abs( 0.995004165278026-0.995004166666667);

**Output:**

h =

1

f =

0.54030230586814

f0 =

1

y =

-sin(x)

y\_val =

0.0

y1 =

-cos(x)

y1\_val =

-1.0

y2 =

sin(x)

y2\_val =

0.0

y3 =

cos(x)

y3\_val =

1.0

y4 =

-sin(x)

y4\_val =

0.0

y5 =

-cos(x)

y5\_val =

-1.0

y6 =

sin(x)

y6\_val =

0.0

approximated\_value =

0.54028

maximum\_error

2.4528e-05

previous\_error =

1.3886e-09