MATLAB

ASSIGNMENT -9

Example The turning moment T on the crankshaft of a steam engine for the crank angle θ degrees is given as follows:

x^o	0	15	30	45	60	75	90	105	120	135	150	165	180
T	0	2.7	5.2	7.0	8.1	8.3	7.9	6.8	5.5	4.1	2.6	1.2	0

Express T in a Fourier series neglecting the harmonic above third.

Code:

```
clc

clear all

syms x

p=input('enter the period:');

l=p/2;

X=input('enter the X-vector:');

Y=input('enter the Y-vector:');

N=length(X);

r=input('enter the number of terms in series:');

a_0=(2/N)*sum(Y);

for n=1:r

a(n)=(2/N)*sum(Y.*cos(n*pi*X/l));

b(n)=(2/N)*sum(Y.*sin(n*pi*X/l));

end

for n=1:r
```

H(n)=a(n)*cos(n*pi*x/l)+b(n)*sin(n*pi*x/l);

end

HS=(a_0)/2+sum(H);

disp('Harmonic series is given by')

disp(HS)

plot(X,Y,'r')

hold on

ezplot(HS,[0,p])

OUTPUT:

enter the period:

pi/12

enter the X-vector:

[0 pi/12 pi/6 pi/4 pi/3 5*pi/12 pi/2 7*pi/12 2*pi/3 3*pi/4 5*pi/6 11*pi/12 pi]

enter the Y-vector:

[0 2.7 5.2 7.0 8.1 8.3 7.9 6.8 5.5 4.1 2.6 1.2 0]

enter the number of terms in series:

5

Harmonic series is given by

(594*cos(24*x))/65 + (594*cos(48*x))/65 + (594*cos(72*x))/65 +

(594*cos(96*x))/65 + (594*cos(120*x))/65 -

(8245035216728501*sin(24*x))/5070602400912917605986812821504

(8245035216728501*sin(48*x))/253530120045645880299340 6410752 +

(8693247934423919*sin(72*x))/1584563250285286751870 87900672 -

(8245035216728501*sin(96*x))/1267650600228229401496703205376 +

(3111383652586581*sin(120*x))/15845632502852867518708 7900672 + 297/65

Graph for the example code: