

## MATLAB ASSIGNMENT - 3

### HARMONIC ANALYSIS

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- SESSION: WINTER SEMESTER 2018-2019
- FACULTY: PROF. POORNIMA T
- SLOT: - L15+L16
- DATE: 18 DEC 2018

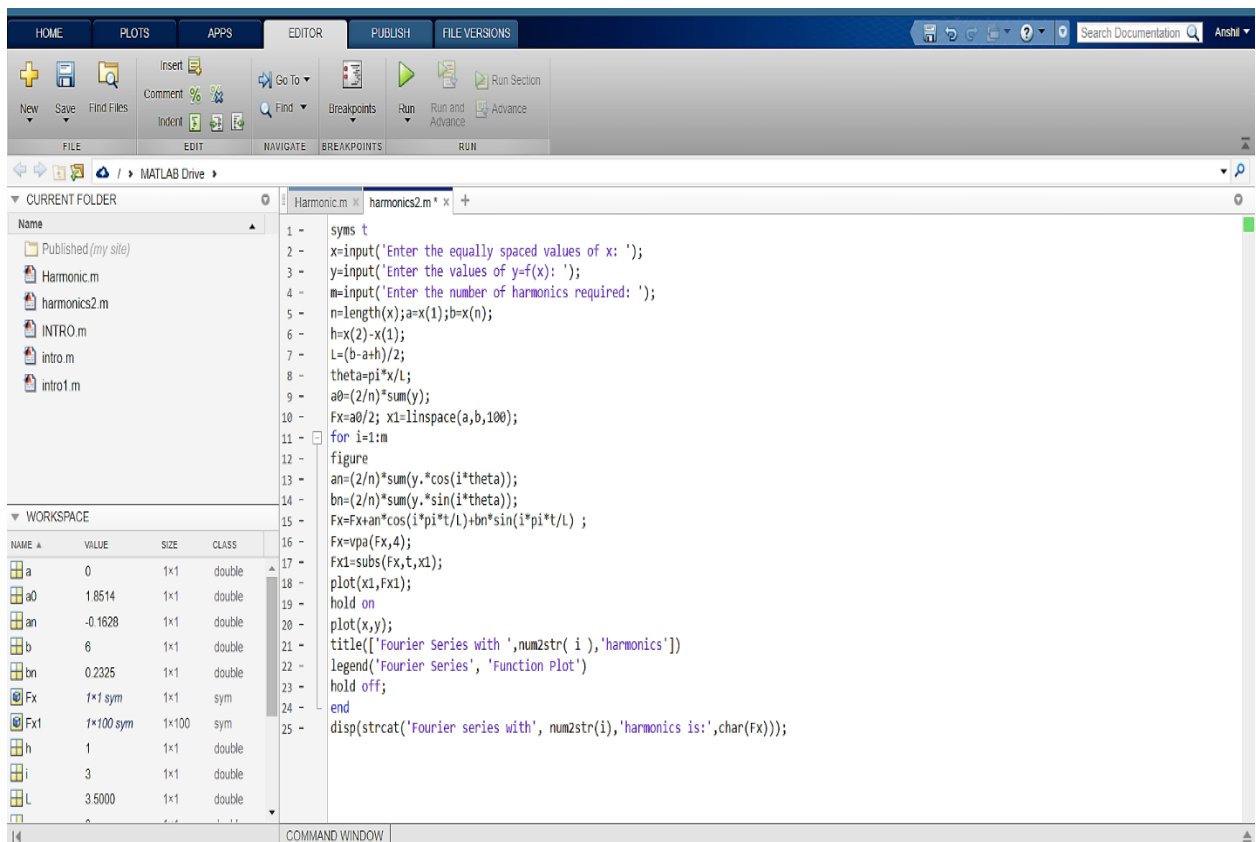
**Q1.** The following table gives the variations of periodic current over a period  $T_0$ .

$T_0$ sec	0	$T/6$	$T/3$	$T/2$	$2T/3$	$5T/6$	$T$
Amp	1.98	1.30	1.05	1.30	-0.88	-0.25	1.98

Show that there is a direct current part of 0.75 amp in the variable current and obtain the amplitude of the first three harmonics (Take  $T = 1$ ).

**Soln:**

**CODE: -**



```

1 - syms t
2 - x=input('Enter the equally spaced values of x: ');
3 - y=input('Enter the values of y=f(x): ');
4 - m=input('Enter the number of harmonics required: ');
5 - n=length(x);a=x(1);b=x(n);
6 - h=x(2)-x(1);
7 - L=(b-a+h)/2;
8 - theta=pi*x/L;
9 - a0=(2/n)*sum(y);
10 - Fx=a0/2; x1=linspace(a,b,100);
11 - for i=1:m
12 - figure
13 - an=(2/n)*sum(y.*cos(i*theta));
14 - bn=(2/n)*sum(y.*sin(i*theta));
15 - Fx=Fx+an*cos(i*pi*t/L)+bn*sin(i*pi*t/L);
16 - Fx=vpa(Fx,4);
17 - Fx1=subs(Fx,t,x1);
18 - plot(x1,Fx1);
19 - hold on
20 - plot(x,y);
21 - title(['Fourier Series with ',num2str(i),'harmonics'])
22 - legend('Fourier Series','Function Plot')
23 - hold off;
24 - end
25 - disp(strcat('Fourier series with ', num2str(i),'harmonics is:',char(Fx)));
  
```

The screenshot shows the MATLAB R2019a environment. The 'CURRENT FOLDER' pane on the left lists files: Published (my site), Harmonic.m, harmonics2.m, INTRO.m, intro.m, and intro1.m. The 'WORKSPACE' pane below it shows variables: a (0, 1x1 double), a0 (1.8514, 1x1 double), an (-0.1628, 1x1 double), b (6, 1x1 double), bn (0.2325, 1x1 double), Fx (1x1 sym), Fx1 (1x100 sym), h (1, 1x1 double), i (3, 1x1 double), and L (3.5000, 1x1 double). The main editor window displays the MATLAB script for harmonic analysis, which includes input prompts, coefficient calculations, and plotting commands. The command window at the bottom is empty.

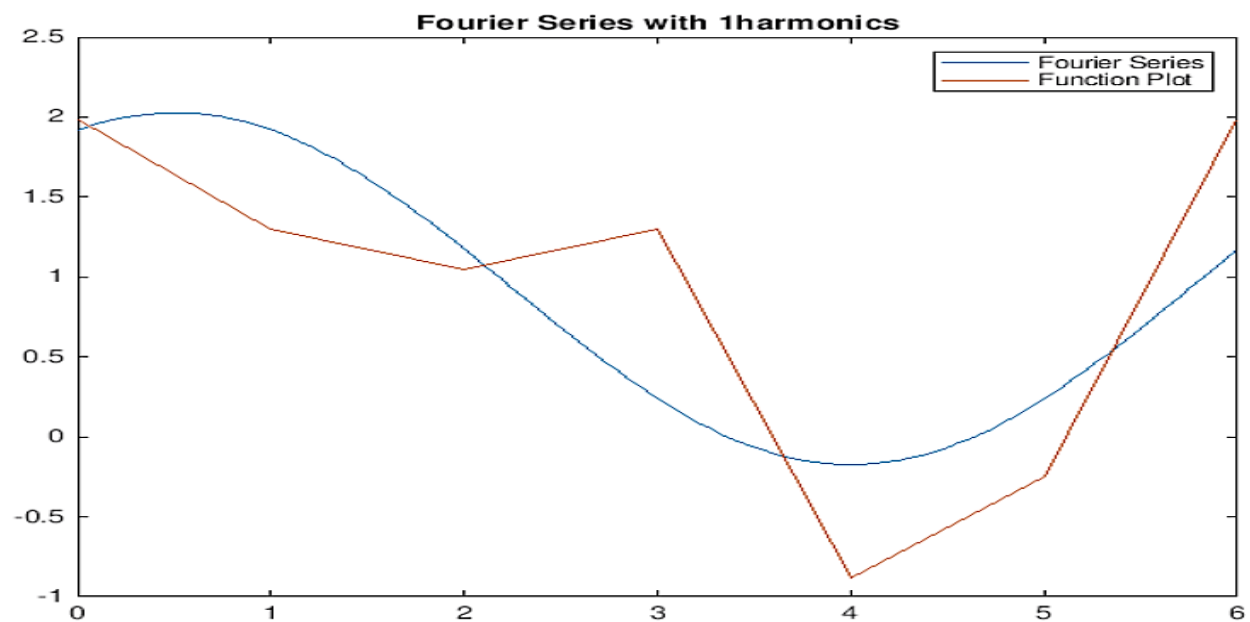
**INPUT AND OUTPUT: -****COMMAND WINDOW**

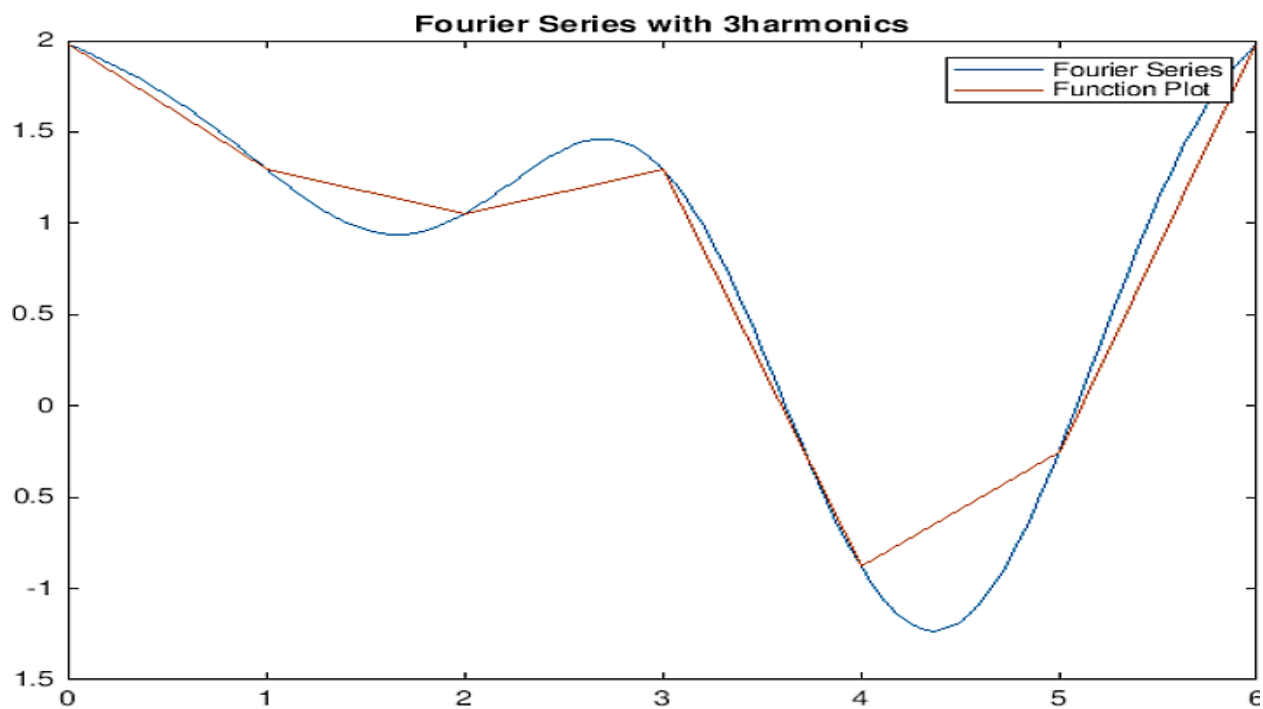
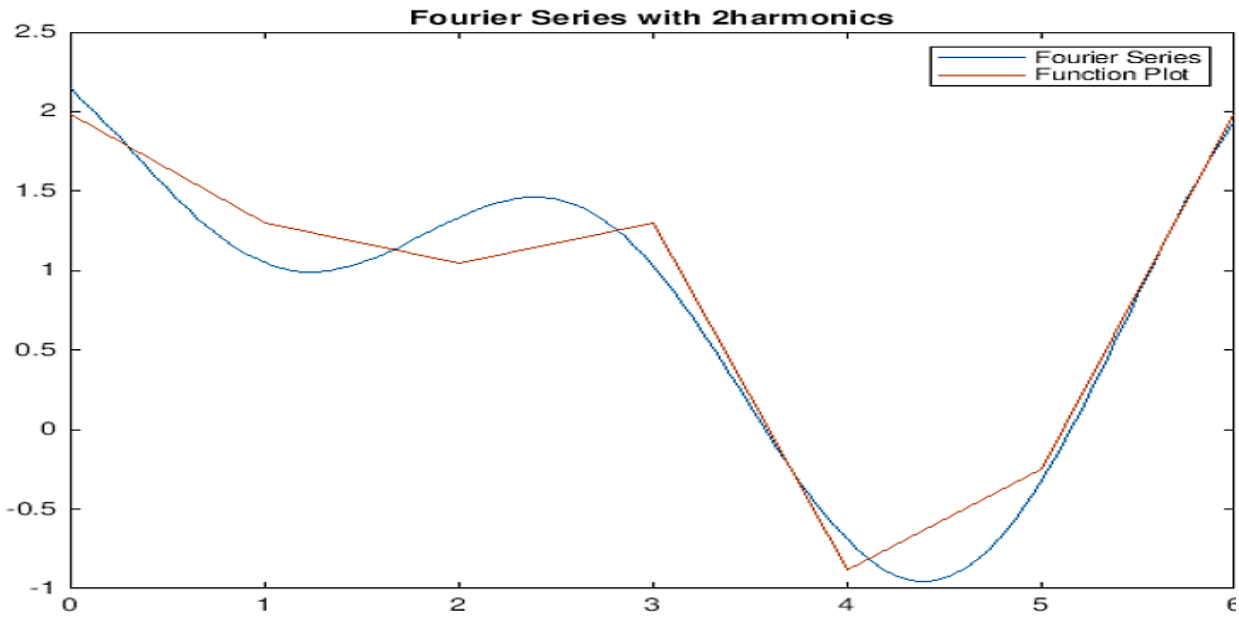
```
>> Harmonic
Enter the equally spaced values of x:
0:6
Enter the values of y=f(x):
[1.98 1.30 1.05 1.30 -0.88 -0.25 1.98]
Enter the number of harmonics required:
3
Fourier series with 3 harmonics is: 0.2325*sin(2.693*t) - 0.1628*cos(2.693*t) + 0.991*cos(0.8976*t) + 0.2261*cos(1.795*t) + 0.4805*sin(0.8976*t) - 0.8375*sin(1.795*t) + 0.9257
```

**COMMAND WINDOW**

```
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of y=f(x):
.30 -0.88 -0.25 1.98]
of harmonics required:

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```

**GRAPHS:**

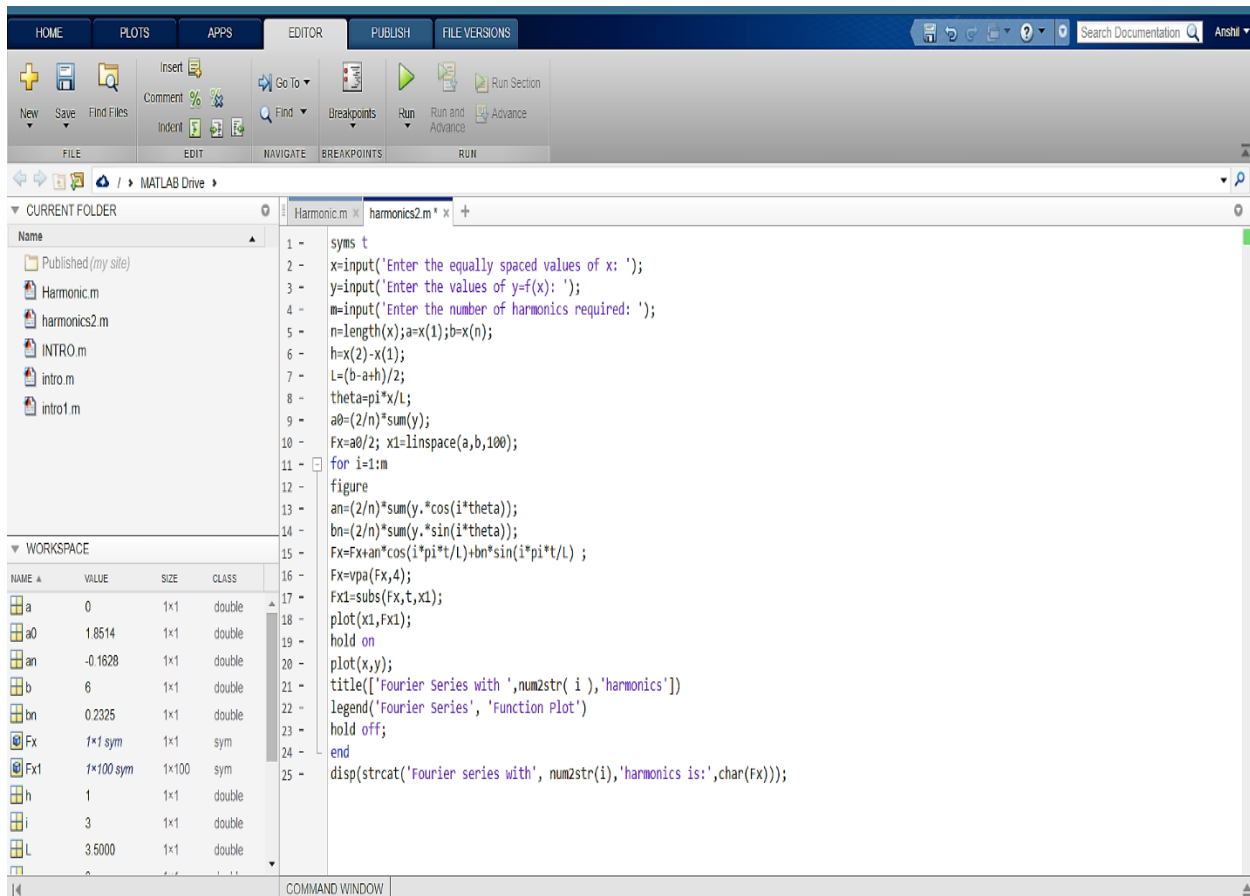


**Q2. Find the constant, the first sine and cosine terms in the Fourier series expansion of the function  $y = f(x)$  tabulated below:**

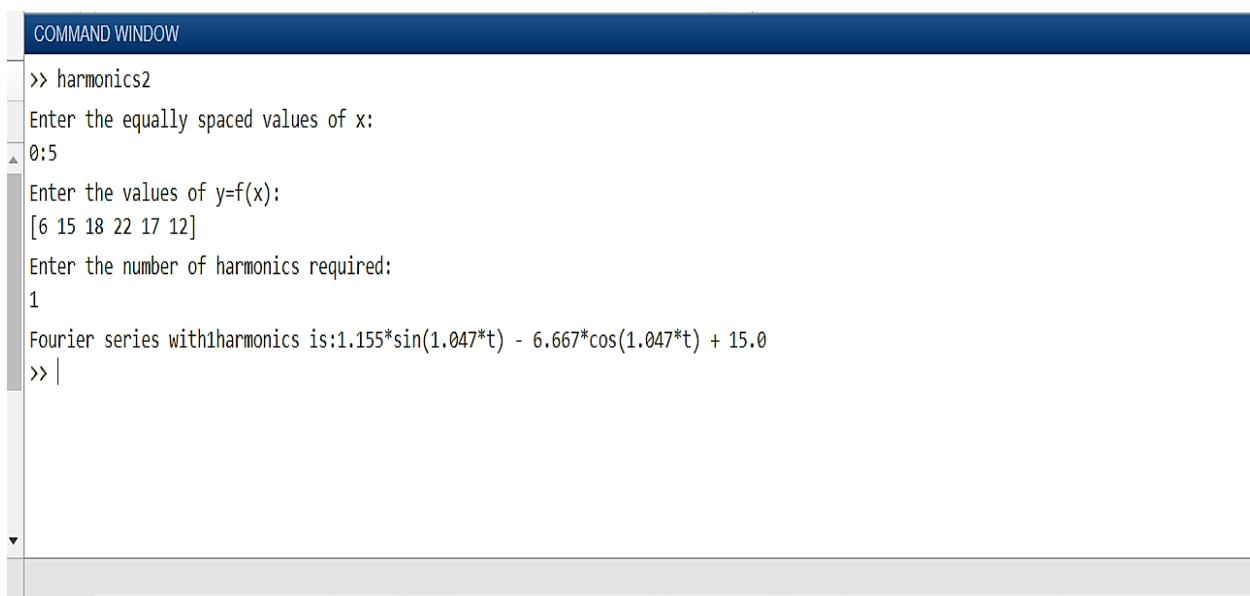
x	0	1	2	3	4	5
F(x)	6	15	18	22	17	12

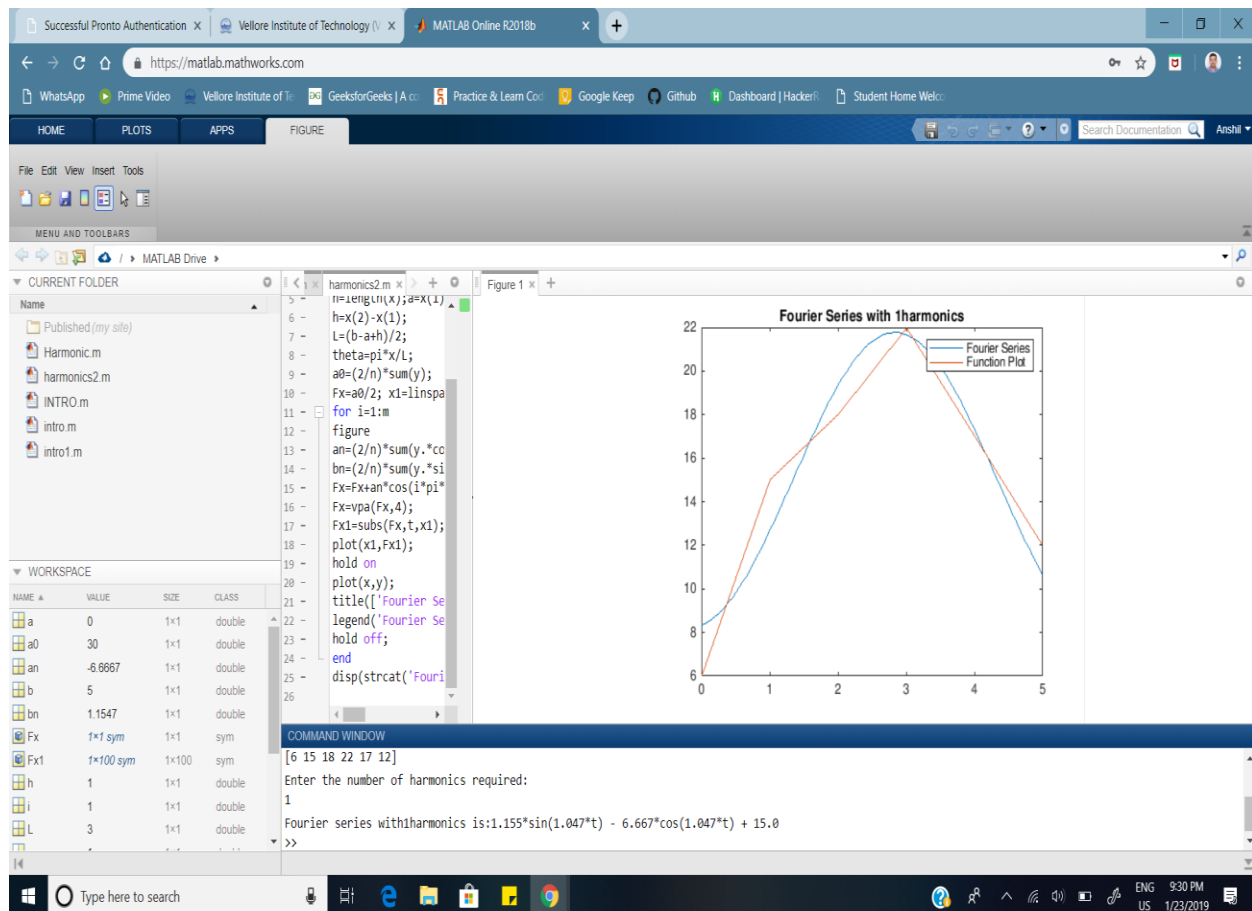
**Soln:**

**CODE: -**



**INPUT AND OUTPUT: -**



**GRAPH: -**

-----**THANK YOU**-----