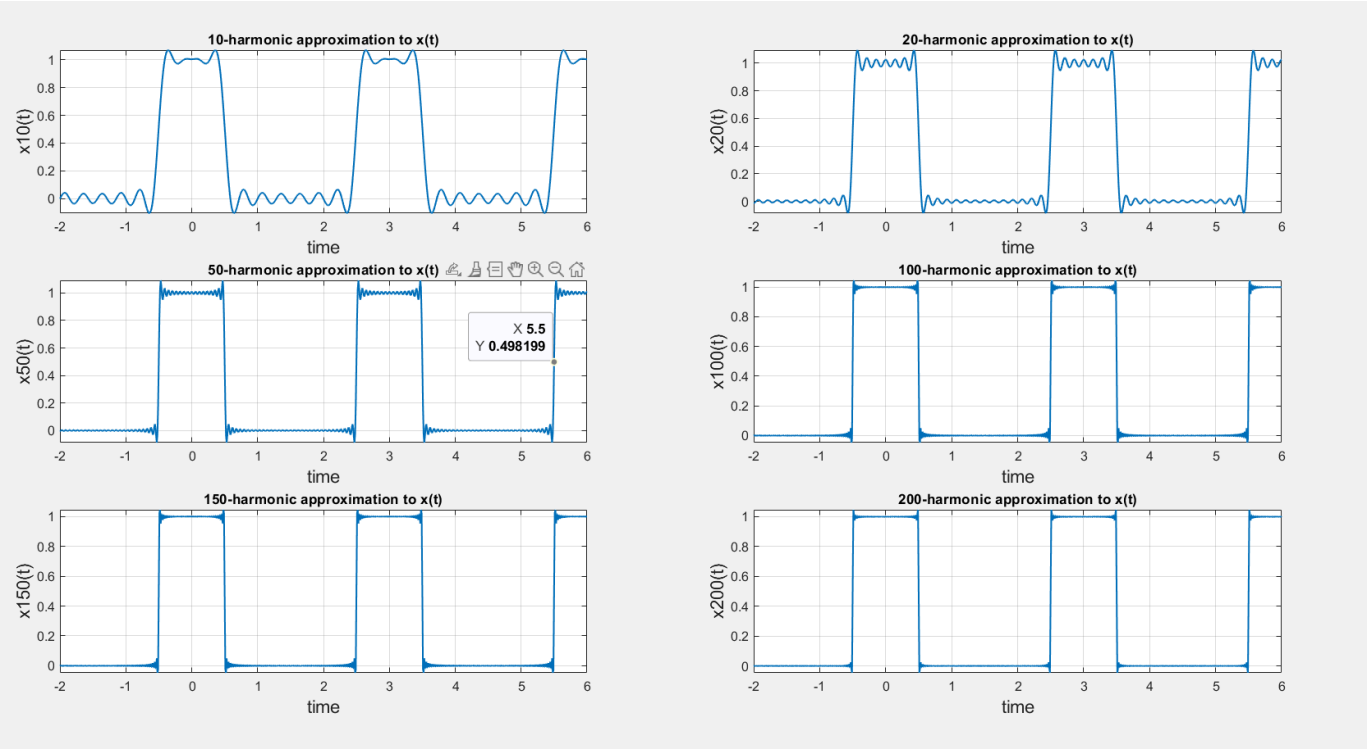
TASK 01:

CODE:

```
% TASK 01
clc
clear all
close all
% Set the dc term "a0"
a0 = 1/3;
% Define number of terms
N = 10;
% Set TFS coefficients.
k = 1:N;
ak = 2*sin(pi*k/3)./(pi*k);
% Create a vector of time instants
t = -2: 1/N/10 :6 ;
% Set the fundamental frequency.
T0 = 3;
omega = 2*pi/T0;
% Compute an approximation to signal using up to 10-th harmonic.
xtTEN = a0;
for i=1:10
   xtTEN = xtTEN + ak(i)*cos(i*omega*t);
end
% Compute an approximation to signal using up to 20-th harmonic.
k = 1:20;
ak = 2*sin(pi*k/3)./(pi*k);
xtTWENTY = a0;
for i=1:20
   xtTWENTY = xtTWENTY + ak(i)*cos(i*omega*t);
end
% Compute an approximation to signal using up to 50-th harmonic.
k = 1:50;
ak = 2*sin(pi*k/3)./(pi*k);
xtFIFTY = a0;
for i=1:50
   xtFIFTY = xtFIFTY + ak(i)*cos(i*omega*t);
end
% Compute an approximation to signal using up to 100-th harmonic.
k = 1:100;
ak = 2*sin(pi*k/3)./(pi*k);
xtHUNDRED = a0;
for i=1:100
   xtHUNDRED = xtHUNDRED + ak(i)*cos(i*omega*t);
end
% Compute an approximation to signal using up to 150-th harmonic.
k = 1:150;
ak = 2*sin(pi*k/3)./(pi*k);
xtONEFIFTY = a0;
for i=1:100
   xtONEFIFTY = xtONEFIFTY + ak(i)*cos(i*omega*t);
```

```
end
% Compute an approximation to signal using up to 200-th harmonic.
k = 1:200;
ak = 2*sin(pi*k/3)./(pi*k);
xtTWOHUNDRED = a0;
for i=1:200
   xtTWOHUNDRED = xtTWOHUNDRED + ak(i)*cos(i*omega*t);
end
% Plot the harmonic approximations
figure;
subplot 321
plot(t, xtTEN, 'linewidth',1);
grid on;
xlabel('time','Fontsize',13);
ylabel('x10(t)','Fontsize',13)
title([num2str(10) ...
'-harmonic approximation to x(t)']);
subplot 322
plot(t, xtTWENTY, 'linewidth',1);
grid on;
xlabel('time','Fontsize',13);
ylabel('x20(t)','Fontsize',13)
title([num2str(20) ...
'-harmonic approximation to x(t)']);
subplot 323
plot(t, xtFIFTY, 'linewidth',1);
grid on;
xlabel('time','Fontsize',13);
ylabel('x50(t)','Fontsize',13)
title([num2str(50) ...
'-harmonic approximation to x(t)']);
subplot 324
plot(t, xtHUNDRED, 'linewidth',1);
grid on;
xlabel('time','Fontsize',13);
ylabel('x100(t)','Fontsize',13)
title([num2str(100) ...
'-harmonic approximation to x(t)']);
subplot 325
plot(t, xtONEFIFTY, 'linewidth',1);
grid on;
xlabel('time','Fontsize',13);
ylabel('x150(t)','Fontsize',13)
title([num2str(150) ...
'-harmonic approximation to x(t)']);
subplot 326
plot(t, xtTWOHUNDRED, 'linewidth',1);
grid on;
xlabel('time','Fontsize',13);
ylabel('x200(t)','Fontsize',13)
title([num2str(200) ...
'-harmonic approximation to x(t)']);
```

SNAPSHOT:



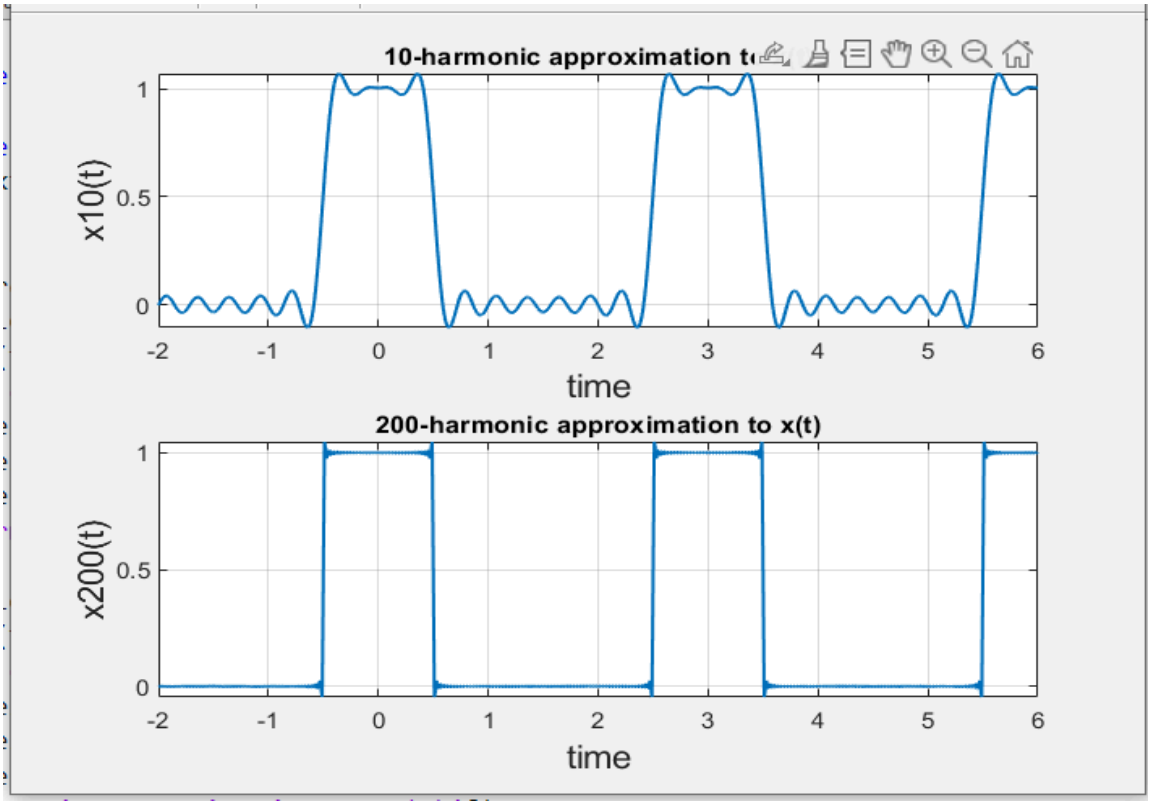
TASK 02:

CODE:

```
clc
clear all
close all
% Set the dc term "a0"
a0 = 1/3;
% Define number of terms
N = 10;
% Set TFS coefficients.
k = 1:N;
ak = 2*sin(pi*k/3)./(pi*k);
% Create a vector of time instants
t = -2: 1/N/10 :6 ;
% Set the fundamental frequency.
T0 = 3;
omega = 2*pi/T0;
% Compute an approximation to signal using up to 10-th harmonic.
xtTEN = a0;
for i=1:10
   if ak(i) >0
       theta=0;
   else
       theta = pi;
   end
   xtTEN = xtTEN + abs(ak(i))*cos(i*omega*t - theta);
```

```
end
% Compute an approximation to signal using up to 200-th harmonic
k = 1:200;
ak = 2*sin(pi*k/3)./(pi*k);
xtTWOHUNDRED = a0;
for i=1:200
   if ak(i) >0
       theta=0;
   else
       theta = pi;
   end
   xtTWOHUNDRED = xtTWOHUNDRED + abs(ak(i))*cos(i*omega*t - theta);
end
figure
subplot 211
plot(t, xtTEN, 'linewidth',1);
grid on;
xlabel('time','Fontsize',13);
ylabel('x10(t)','Fontsize',13)
title([num2str(10) ...
'-harmonic approximation to x(t)']);
subplot 212
plot(t, xtTWOHUNDRED, 'linewidth',1);
grid on;
xlabel('time','Fontsize',13);
ylabel('x200(t)','Fontsize',13)
title([num2str(200) ...
'-harmonic approximation to x(t)']);
```

SNAPSHOT:



TASK 03:

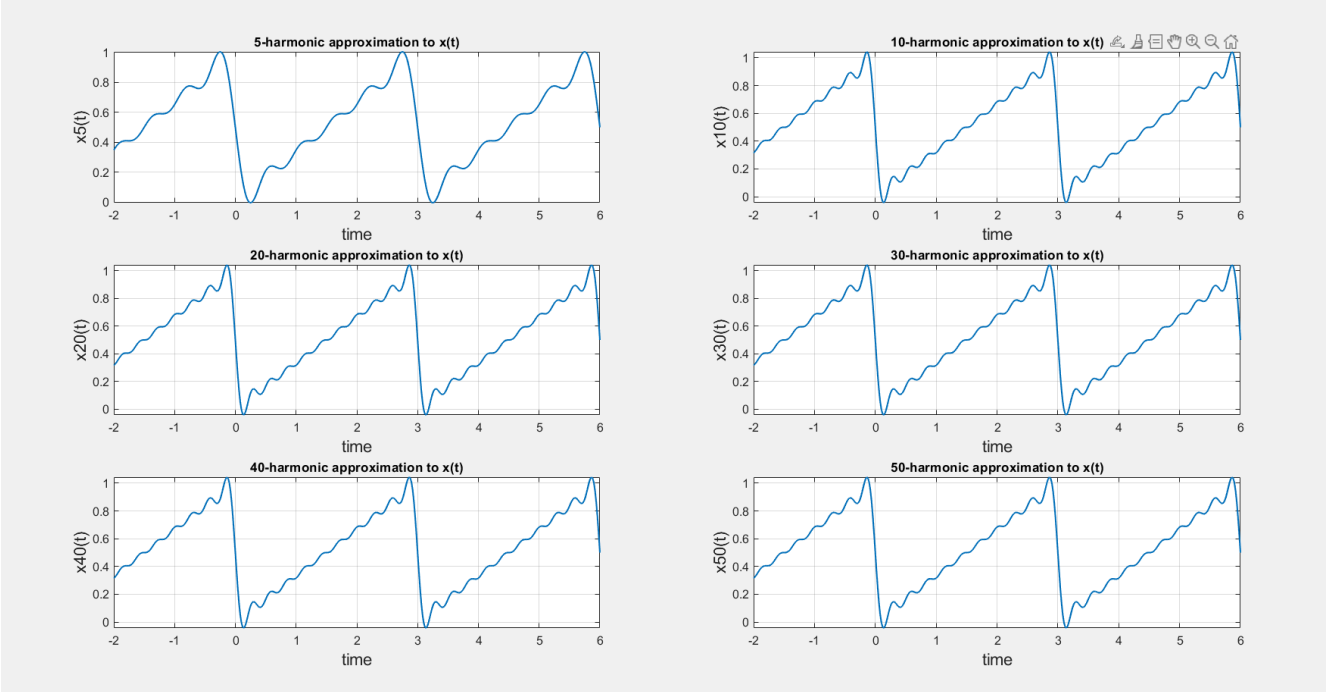
CODE:

```
clc
clear all
close all
% Set the dc term "a0"
a =1 ;
a0 = a/2;
% Define number of terms
N = 5;
% Set TFS coefficients.
k = 1:N;
ak = 2*a*( sin(2*pi*k)./(2*pi*k) + (cos(2*pi*k)-1)./(4*pi^2*k.^2));
bk = 2*a*( sin(2*pi*k)./(4*pi^2*k.^2) - cos(2*pi*k)./(2*pi*k) );
% Create a vector of time instants
t = -2: 1/N/10 :6 ;
% Set the fundamental frequency.
T0 = 3;
omega = 2*pi/T0;
% Compute an approximation to signal using up to 5-th harmonic.
xtFIVE = a0;
for i=1:5
   xtFIVE = xtFIVE + ak(i)*cos(i*omega*t) + bk(i)*sin(i*omega*t);
end
% Compute an approximation to signal using up to 10-th harmonic.
k = 1:10;
ak = 2*a*( sin(2*pi*k)./(2*pi*k) + (cos(2*pi*k)-1)./(4*pi^2*k.^2));
bk = 2*a*( sin(2*pi*k)./(4*pi^2*k.^2) - cos(2*pi*k)./(2*pi*k) );
xtTEN = a0;
for i=1:10
   xtTEN = xtTEN + ak(i)*cos(i*omega*t) + bk(i)*sin(i*omega*t);
end
% Compute an approximation to signal using up to 20-th harmonic.
k = 1:20;
ak = 2*a*( sin(2*pi*k)./(2*pi*k) + (cos(2*pi*k)-1)./(4*pi^2*k.^2));
bk = 2*a*( sin(2*pi*k)./(4*pi^2*k.^2) - cos(2*pi*k)./(2*pi*k) );
xtTWENTY = a0;
for i=1:10
   xtTWENTY = xtTWENTY + ak(i)*cos(i*omega*t) + bk(i)*sin(i*omega*t);
end
% Compute an approximation to signal using up to 30-th harmonic.
k = 1:30;
ak = 2*a*( sin(2*pi*k)./(2*pi*k) + (cos(2*pi*k)-1)./(4*pi^2*k.^2));
bk = 2*a*( sin(2*pi*k)./(4*pi^2*k.^2) - cos(2*pi*k)./(2*pi*k) );
xtTHIRTY = a0;
for i=1:10
   xtTHIRTY = xtTHIRTY + ak(i)*cos(i*omega*t) + bk(i)*sin(i*omega*t);
end
% Compute an approximation to signal using up to 40-th harmonic.
k = 1:40;
ak = 2*a*( sin(2*pi*k)./(2*pi*k) + (cos(2*pi*k)-1)./(4*pi^2*k.^2));
bk = 2*a*( sin(2*pi*k)./(4*pi^2*k.^2) - cos(2*pi*k)./(2*pi*k) );
```

```
xtFORTY = a0;
for i=1:10
   xtFORTY = xtFORTY + ak(i)*cos(i*omega*t) + bk(i)*sin(i*omega*t);
end
% Compute an approximation to signal using up to 50-th harmonic.
k = 1:50;
ak = 2*a*( sin(2*pi*k)./(2*pi*k) + (cos(2*pi*k)-1)./(4*pi^2*k.^2));
bk = 2*a*( sin(2*pi*k)./(4*pi^2*k.^2) - cos(2*pi*k)./(2*pi*k) );
xtFIFTY = a0;
for i=1:10
   xtFIFTY = xtFIFTY + ak(i)*cos(i*omega*t) + bk(i)*sin(i*omega*t);
end
%obtaining plots
figure
subplot 321
plot(t, xtFIVE, 'linewidth',1);
grid on;
xlabel('time','Fontsize',13);
ylabel('x5(t)','Fontsize',13)
title([num2str(5) ...
'-harmonic approximation to x(t)']);
subplot 322
plot(t, xtTEN, 'linewidth',1);
grid on;
xlabel('time','Fontsize',13);
ylabel('x10(t)','Fontsize',13)
title([num2str(10) ...
'-harmonic approximation to x(t)']);
subplot 323
plot(t, xtTWENTY, 'linewidth',1);
grid on;
xlabel('time','Fontsize',13);
ylabel('x20(t)','Fontsize',13)
title([num2str(20) ...
'-harmonic approximation to x(t)']);
subplot 324
plot(t, xtTHIRTY, 'linewidth',1);
grid on;
xlabel('time','Fontsize',13);
ylabel('x30(t)','Fontsize',13)
title([num2str(30) ...
'-harmonic approximation to x(t)']);
subplot 325
plot(t, xtFORTY, 'linewidth',1);
grid on;
xlabel('time','Fontsize',13);
ylabel('x40(t)','Fontsize',13)
title([num2str(40) ...
'-harmonic approximation to x(t)']);
subplot 326
plot(t, xtFIFTY, 'linewidth',1);
grid on;
xlabel('time','Fontsize',13);
```

```
ylabel('x50(t)','Fontsize',13)
title([num2str(50) ...
'-harmonic approximation to x(t)']);
```

SNAPSHOT:



TASK 04:

CODE:

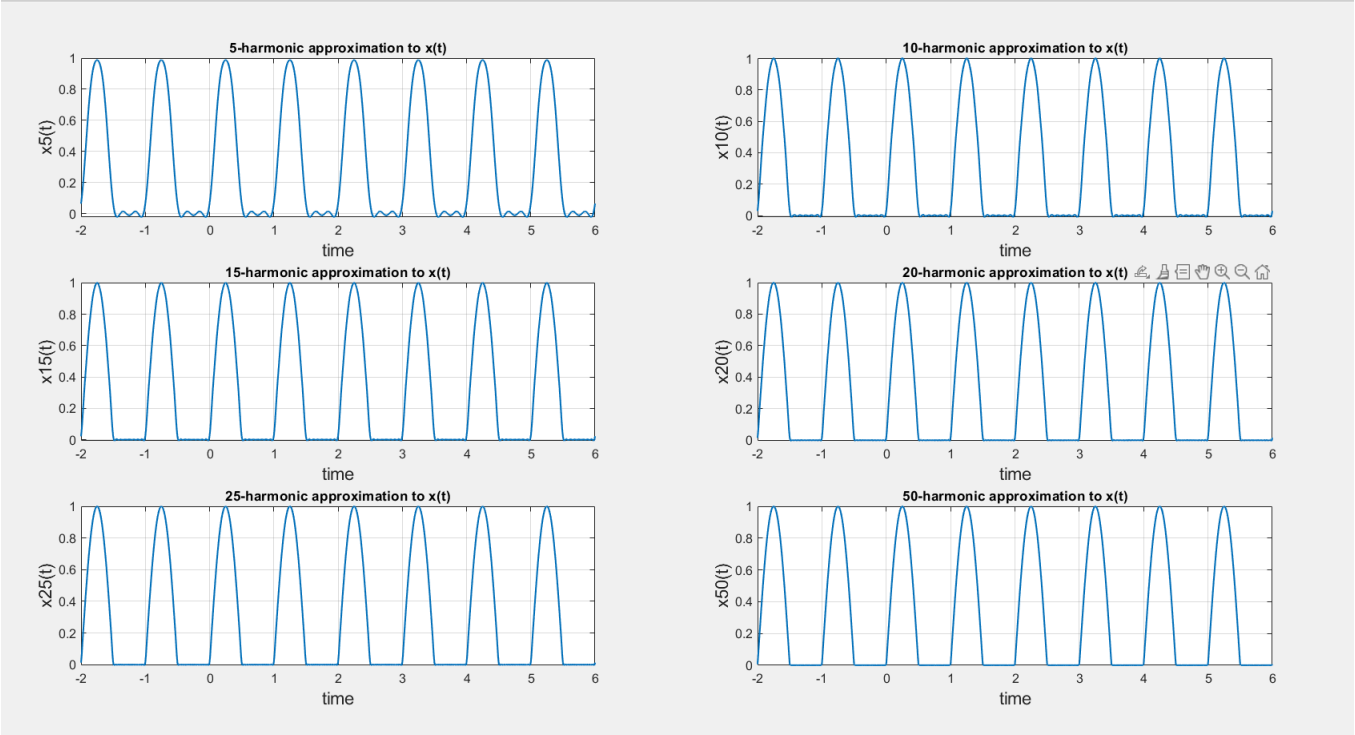
```
clc
clear all
close all
% Set the dc term "a0"
a0 = 1/pi;
% Define number of terms
N = 10;
% Set TFS coefficients.
k = 1:5;
% Create a vector of time instants
t = -2: 1/N/10 :6 ;
% Set the fundamental frequency.
T0 = 1;
omega = 2*pi/T0;
% Compute an approximation to signal using up to 5-th harmonic.
xtFIVE = a0;
for i=1:5
   if mod(k(i),2)==0
       ak = -2/(pi*(k(i)^2-1));
   else
       ak=0;
```

```
    end
    if k(i)==1
        bk = 1/2;
    else
        bk=0;
    end
    xtFIVE = xtFIVE + ak*cos(i*omega*t) + bk*sin(i*omega*t);
end
% Compute an approximation to signal using up to 10-th harmonic.
xtTEN = a0;
k = 1:10;
for i=1:10
    if mod(k(i),2)==0
        ak = -2/(pi*(k(i)^2-1));
    else
        ak=0;
    end
    if k(i)==1
        bk = 1/2;
    else
        bk=0;
    end
    xtTEN = xtTEN + ak*cos(i*omega*t) + bk*sin(i*omega*t);
end
% Compute an approximation to signal using up to 15-th harmonic.
xtFIFTEEN = a0;
k = 1:15;
for i=1:15
    if mod(k(i),2)==0
        ak = -2/(pi*(k(i)^2-1));
    else
        ak=0;
    end
    if k(i)==1
        bk = 1/2;
    else
        bk=0;
    end
    xtFIFTEEN = xtFIFTEEN + ak*cos(i*omega*t) + bk*sin(i*omega*t);
end
% Compute an approximation to signal using up to 20-th harmonic.
xtTWENTY = a0;
k = 1:20;
for i=1:20
    if mod(k(i),2)==0
        ak = -2/(pi*(k(i)^2-1));
    else
        ak=0;
    end
    if k(i)==1
        bk = 1/2;
    else
        bk=0;
```

```
    end
    xtTWENTY = xtTWENTY + ak*cos(i*omega*t) + bk*sin(i*omega*t);
end
% Compute an approximation to signal using up to 25-th harmonic.
xtTWENTYFIVE = a0;
k = 1:25;
for i=1:25
    if mod(k(i),2)==0
        ak = -2/(pi*(k(i)^2-1));
    else
        ak=0;
    end
    if k(i)==1
        bk = 1/2;
    else
        bk=0;
    end
    xtTWENTYFIVE = xtTWENTYFIVE + ak*cos(i*omega*t) + bk*sin(i*omega*t);
end
% Compute an approximation to signal using up to 50-th harmonic.
xtFIFTY = a0;
k = 1:50;
for i=1:50
    if mod(k(i),2)==0
        ak = -2/(pi*(k(i)^2-1));
    else
        ak=0;
    end
    if k(i)==1
        bk = 1/2;
    else
        bk=0;
    end
    xtFIFTY = xtFIFTY + ak*cos(i*omega*t) + bk*sin(i*omega*t);
end
figure
subplot 321
plot(t, xtFIVE, 'linewidth',1);
grid on;
xlabel('time','Fontsize',13);
ylabel('x5(t)','Fontsize',13)
title([num2str(5) ...
'-harmonic approximation to x(t)']);
subplot 322
plot(t, xtTEN, 'linewidth',1);
grid on;
xlabel('time','Fontsize',13);
ylabel('x10(t)','Fontsize',13)
title([num2str(10) ...
'-harmonic approximation to x(t)']);
subplot 323
plot(t, xtFIFTEEN, 'linewidth',1);
grid on;
```

```
xlabel('time','Fontsize',13);
ylabel('x15(t)','Fontsize',13)
title([num2str(15) ...
'-harmonic approximation to x(t)']);
subplot 324
plot(t, xtTWENTY, 'linewidth',1);
grid on;
xlabel('time','Fontsize',13);
ylabel('x20(t)','Fontsize',13)
title([num2str(20) ...
'-harmonic approximation to x(t)']);
subplot 325
plot(t, xtTWENTYFIVE, 'linewidth',1);
grid on;
xlabel('time','Fontsize',13);
ylabel('x25(t)','Fontsize',13)
title([num2str(25) ...
'-harmonic approximation to x(t)']);
subplot 326
plot(t, xtFIFTY, 'linewidth',1);
grid on;
xlabel('time','Fontsize',13);
ylabel('x50(t)','Fontsize',13)
title([num2str(50) ...
'-harmonic approximation to x(t)']);
```

SNAPSHOT:



TASK 05

CODE:

```
% TASK 01
clc
clear all
close all
% Set the dc term "a0"
a0 = 1/3;
% Define number of terms
N = 10;
% Set TFS coefficients.
k = 1:N;
ak = 2*sin(pi*k/3)./(pi*k);
% Create a vector of time instants
t = -2: 1/N/10 :6;
% Set the fundamental frequency.
T0 = 3;
omega = 2*pi/T0;
% Compute an approximation to signal using up to 10-th harmonic.
xtTEN = a0;
for i=1:10
   xtTEN = xtTEN + ak(i)*cos(i*omega*t);
end
% Compute an approximation to signal using up to 20-th harmonic.
k = 1:20;
ak = 2*sin(pi*k/3)./(pi*k);
xtTWENTY = a0;
for i=1:20
   xtTWENTY = xtTWENTY + ak(i)*cos(i*omega*t);
end
% Compute an approximation to signal using up to 50-th harmonic.
k = 1:50;
ak = 2*sin(pi*k/3)./(pi*k);
xtFIFTY = a0;
for i=1:50
   xtFIFTY = xtFIFTY + ak(i)*cos(i*omega*t);
end
% Compute an approximation to signal using up to 100-th harmonic.
k = 1:100;
ak = 2*sin(pi*k/3)./(pi*k);
xtHUNDRED = a0;
for i=1:100
   xtHUNDRED = xtHUNDRED + ak(i)*cos(i*omega*t);
end
% Compute an approximation to signal using up to 150-th harmonic.
k = 1:150;
ak = 2*sin(pi*k/3)./(pi*k);
xtONEFIFTY = a0;
for i=1:100
   xtONEFIFTY = xtONEFIFTY + ak(i)*cos(i*omega*t);
end
% Compute an approximation to signal using up to 200-th harmonic.
```

```
k = 1:200;
ak = 2*sin(pi*k/3)./(pi*k);
xtTWOHUNDRED = a0;
for i=1:200
   xtTWOHUNDRED = xtTWOHUNDRED + ak(i)*cos(i*omega*t);
end
% Plot the harmonic approximations
figure;
subplot 321
plot(t, xtTEN, 'linewidth',1);
grid on;
xlabel('time','Fontsize',13);
ylabel('x10(t)','Fontsize',13)
title([num2str(10) ...
'-harmonic approximation to x(t)']);
subplot 322
plot(t, xtTWENTY, 'linewidth',1);
grid on;
xlabel('time','Fontsize',13);
ylabel('x20(t)','Fontsize',13)
title([num2str(20) ...
'-harmonic approximation to x(t)']);
subplot 323
plot(t, xtFIFTY, 'linewidth',1);
grid on;
xlabel('time','Fontsize',13);
ylabel('x50(t)','Fontsize',13)
title([num2str(50) ...
'-harmonic approximation to x(t)']);
subplot 324
plot(t, xtHUNDRED, 'linewidth',1);
grid on;
xlabel('time','Fontsize',13);
ylabel('x100(t)','Fontsize',13)
title([num2str(100) ...
'-harmonic approximation to x(t)']);
subplot 325
plot(t, xtONEFIFTY, 'linewidth',1);
grid on;
xlabel('time','Fontsize',13);
ylabel('x150(t)','Fontsize',13)
title([num2str(150) ...
'-harmonic approximation to x(t)']);
subplot 326
plot(t, xtTWOHUNDRED, 'linewidth',1);
grid on;
xlabel('time','Fontsize',13);
ylabel('x200(t)','Fontsize',13)
title([num2str(200) ...
'-harmonic approximation to x(t)']);
%% TASK 02
clc
clear all
```

```
close all
% Set the dc term "a0"
a0 = 1/3;
% Define number of terms
N = 10;
% Set TFS coefficients.
k = 1:N;
ak = 2*sin(pi*k/3)./(pi*k);
% Create a vector of time instants
t = -2: 1/N/10 :6 ;
% Set the fundamental frequency.
T0 = 3;
omega = 2*pi/T0;
% Compute an approximation to signal using up to 10-th harmonic.
xtTEN = a0;
for i=1:10
   if ak(i) >0
       theta=0;
   else
       theta = pi;
   end
   xtTEN = xtTEN + abs(ak(i))*cos(i*omega*t - theta);
end
% Compute an approximation to signal using up to 200-th harmonic
k = 1:200;
ak = 2*sin(pi*k/3)./(pi*k);
xtTWOHUNDRED = a0;
for i=1:200
   if ak(i) >0
       theta=0;
   else
       theta = pi;
   end
   xtTWOHUNDRED = xtTWOHUNDRED + abs(ak(i))*cos(i*omega*t - theta);
end
%obtaining plots
figure
subplot 211
plot(t, xtTEN, 'linewidth',1);
grid on;
xlabel('time','Fontsize',13);
ylabel('x10(t)','Fontsize',13)
title([num2str(10) ...
'-harmonic approximation to x(t)']);
subplot 212
plot(t, xtTWOHUNDRED, 'linewidth',1);
grid on;
xlabel('time','Fontsize',13);
ylabel('x200(t)','Fontsize',13)
title([num2str(200) ...
'-harmonic approximation to x(t)']);
%% TASK 03
clc
```

```
clear all
close all
% Set the dc term "a0"
a =1 ;
a0 = a/2;
% Define number of terms
N = 5;
% Set TFS coefficients.
k = 1:N;
ak = 2*a*( sin(2*pi*k)./(2*pi*k) + (cos(2*pi*k)-1)./(4*pi^2*k.^2));
bk = 2*a*( sin(2*pi*k)./(4*pi^2*k.^2) - cos(2*pi*k)./(2*pi*k) );
% Create a vector of time instants
t = -2: 1/N/10 :6 ;
% Set the fundamental frequency.
T0 = 3;
omega = 2*pi/T0;
% Compute an approximation to signal using up to 5-th harmonic.
xtFIVE = a0;
for i=1:5
   xtFIVE = xtFIVE + ak(i)*cos(i*omega*t) + bk(i)*sin(i*omega*t);
end
% Compute an approximation to signal using up to 10-th harmonic.
k = 1:10;
ak = 2*a*( sin(2*pi*k)./(2*pi*k) + (cos(2*pi*k)-1)./(4*pi^2*k.^2));
bk = 2*a*( sin(2*pi*k)./(4*pi^2*k.^2) - cos(2*pi*k)./(2*pi*k) );
xtTEN = a0;
for i=1:10
   xtTEN = xtTEN + ak(i)*cos(i*omega*t) + bk(i)*sin(i*omega*t);
end
% Compute an approximation to signal using up to 20-th harmonic.
k = 1:20;
ak = 2*a*( sin(2*pi*k)./(2*pi*k) + (cos(2*pi*k)-1)./(4*pi^2*k.^2));
bk = 2*a*( sin(2*pi*k)./(4*pi^2*k.^2) - cos(2*pi*k)./(2*pi*k) );
xtTWENTY = a0;
for i=1:10
   xtTWENTY = xtTWENTY + ak(i)*cos(i*omega*t) + bk(i)*sin(i*omega*t);
end
% Compute an approximation to signal using up to 30-th harmonic.
k = 1:30;
ak = 2*a*( sin(2*pi*k)./(2*pi*k) + (cos(2*pi*k)-1)./(4*pi^2*k.^2));
bk = 2*a*( sin(2*pi*k)./(4*pi^2*k.^2) - cos(2*pi*k)./(2*pi*k) );
xtTHIRTY = a0;
for i=1:10
   xtTHIRTY = xtTHIRTY + ak(i)*cos(i*omega*t) + bk(i)*sin(i*omega*t);
end
% Compute an approximation to signal using up to 40-th harmonic.
k = 1:40;
ak = 2*a*( sin(2*pi*k)./(2*pi*k) + (cos(2*pi*k)-1)./(4*pi^2*k.^2));
bk = 2*a*( sin(2*pi*k)./(4*pi^2*k.^2) - cos(2*pi*k)./(2*pi*k) );
xtFORTY = a0;
for i=1:10
   xtFORTY = xtFORTY + ak(i)*cos(i*omega*t) + bk(i)*sin(i*omega*t);
end
```

```
% Compute an approximation to signal using up to 50-th harmonic.
k = 1:50;
ak = 2*a*( sin(2*pi*k)./(2*pi*k) + (cos(2*pi*k)-1)./(4*pi^2*k.^2));
bk = 2*a*( sin(2*pi*k)./(4*pi^2*k.^2) - cos(2*pi*k)./(2*pi*k) );
xtFIFTY = a0;
for i=1:10
   xtFIFTY = xtFIFTY + ak(i)*cos(i*omega*t) + bk(i)*sin(i*omega*t);
end
%obtaining plots
figure
subplot 321
plot(t, xtFIVE, 'linewidth',1);
grid on;
xlabel('time','Fontsize',13);
ylabel('x5(t)','Fontsize',13)
title([num2str(5) ...
'-harmonic approximation to x(t)']);
subplot 322
plot(t, xtTEN, 'linewidth',1);
grid on;
xlabel('time','Fontsize',13);
ylabel('x10(t)','Fontsize',13)
title([num2str(10) ...
'-harmonic approximation to x(t)']);
subplot 323
plot(t, xtTWENTY, 'linewidth',1);
grid on;
xlabel('time','Fontsize',13);
ylabel('x20(t)','Fontsize',13)
title([num2str(20) ...
'-harmonic approximation to x(t)']);
subplot 324
plot(t, xtTHIRTY, 'linewidth',1);
grid on;
xlabel('time','Fontsize',13);
ylabel('x30(t)','Fontsize',13)
title([num2str(30) ...
'-harmonic approximation to x(t)']);
subplot 325
plot(t, xtFORTY, 'linewidth',1);
grid on;
xlabel('time','Fontsize',13);
ylabel('x40(t)','Fontsize',13)
title([num2str(40) ...
'-harmonic approximation to x(t)']);
subplot 326
plot(t, xtFIFTY, 'linewidth',1);
grid on;
xlabel('time','Fontsize',13);
ylabel('x50(t)','Fontsize',13)
title([num2str(50) ...
'-harmonic approximation to x(t)']);
%% TASK 04
```

```
clc
clear all
close all
% Set the dc term "a0"
a0 = 1/pi;
% Define number of terms
N = 10;
% Set TFS coefficients.
k = 1:5;
% Create a vector of time instants
t = -2: 1/N/10 :6 ;
% Set the fundamental frequency.
T0 = 1;
omega = 2*pi/T0;
% Compute an approximation to signal using up to 5-th harmonic.
xtFIVE = a0;
for i=1:5
   if mod(k(i),2)==0
       ak = -2/(pi*(k(i)^2-1));
   else
       ak=0;
   end
   if k(i)==1
       bk = 1/2;
   else
       bk=0;
   end
   xtFIVE = xtFIVE + ak*cos(i*omega*t) + bk*sin(i*omega*t);
end
% Compute an approximation to signal using up to 10-th harmonic.
xtTEN = a0;
k = 1:10;
for i=1:10
   if mod(k(i),2)==0
       ak = -2/(pi*(k(i)^2-1));
   else
       ak=0;
   end
   if k(i)==1
       bk = 1/2;
   else
       bk=0;
   end
   xtTEN = xtTEN + ak*cos(i*omega*t) + bk*sin(i*omega*t);
end
% Compute an approximation to signal using up to 15-th harmonic.
xtFIFTEEN = a0;
k = 1:15;
for i=1:15
   if mod(k(i),2)==0
       ak = -2/(pi*(k(i)^2-1));
   else
       ak=0;
```

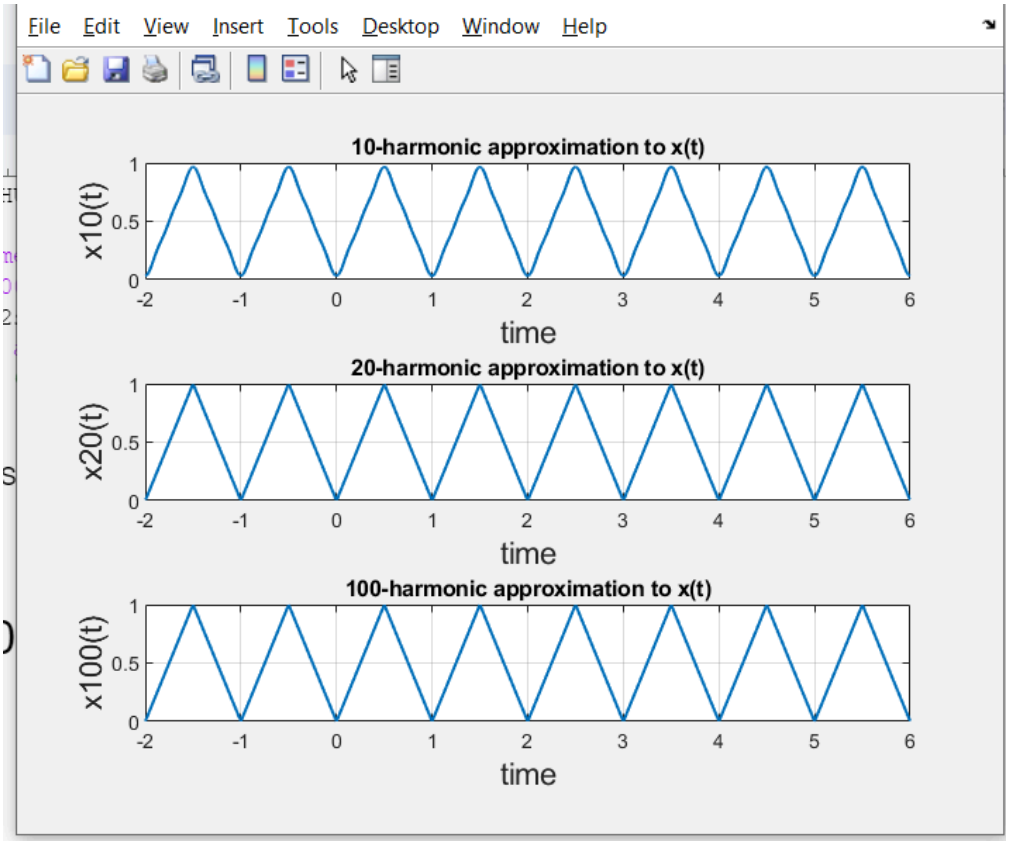
```
    end
    if k(i)==1
        bk = 1/2;
    else
        bk=0;
    end
    xtFIFTEEN = xtFIFTEEN + ak*cos(i*omega*t) + bk*sin(i*omega*t);
end
% Compute an approximation to signal using up to 20-th harmonic.
xtTWENTY = a0;
k = 1:20;
for i=1:20
    if mod(k(i),2)==0
        ak = -2/(pi*(k(i)^2-1));
    else
        ak=0;
    end
    if k(i)==1
        bk = 1/2;
    else
        bk=0;
    end
    xtTWENTY = xtTWENTY + ak*cos(i*omega*t) + bk*sin(i*omega*t);
end
% Compute an approximation to signal using up to 25-th harmonic.
xtTWENTYFIVE = a0;
k = 1:25;
for i=1:25
    if mod(k(i),2)==0
        ak = -2/(pi*(k(i)^2-1));
    else
        ak=0;
    end
    if k(i)==1
        bk = 1/2;
    else
        bk=0;
    end
    xtTWENTYFIVE = xtTWENTYFIVE + ak*cos(i*omega*t) + bk*sin(i*omega*t);
end
% Compute an approximation to signal using up to 50-th harmonic.
xtFIFTY = a0;
k = 1:50;
for i=1:50
    if mod(k(i),2)==0
        ak = -2/(pi*(k(i)^2-1));
    else
        ak=0;
    end
    if k(i)==1
        bk = 1/2;
    else
        bk=0;
```

```
    end
    xtFIFTY = xtFIFTY + ak*cos(i*omega*t) + bk*sin(i*omega*t);
end
figure
subplot 321
plot(t, xtFIVE, 'linewidth',1);
grid on;
xlabel('time','Fontsize',13);
ylabel('x5(t)','Fontsize',13)
title([num2str(5) ...
'-harmonic approximation to x(t)']);
subplot 322
plot(t, xtTEN, 'linewidth',1);
grid on;
xlabel('time','Fontsize',13);
ylabel('x10(t)','Fontsize',13)
title([num2str(10) ...
'-harmonic approximation to x(t)']);
subplot 323
plot(t, xtFIFTEEN, 'linewidth',1);
grid on;
xlabel('time','Fontsize',13);
ylabel('x15(t)','Fontsize',13)
title([num2str(15) ...
'-harmonic approximation to x(t)']);
subplot 324
plot(t, xtTWENTY, 'linewidth',1);
grid on;
xlabel('time','Fontsize',13);
ylabel('x20(t)','Fontsize',13)
title([num2str(20) ...
'-harmonic approximation to x(t)']);
subplot 325
plot(t, xtTWENTYFIVE, 'linewidth',1);
grid on;
xlabel('time','Fontsize',13);
ylabel('x25(t)','Fontsize',13)
title([num2str(25) ...
'-harmonic approximation to x(t)']);
subplot 326
plot(t, xtFIFTY, 'linewidth',1);
grid on;
xlabel('time','Fontsize',13);
ylabel('x50(t)','Fontsize',13)
title([num2str(50) ...
'-harmonic approximation to x(t)']);
%% TASK 05 BONUS
clc
clear all
close all
% Set the dc term "a0"
m=1;
a0 = m/2;
```

```
% Define number of terms
N = 10;
% Set TFS coefficients.
k = 1:N;
ak= zeros(1,N);
i=2;
while true
   % ak(i) = (4*m/k(i)^2*pi^2)*(2*cos(k(i)*pi/2)-cos(k(i)*pi)-1);
   ak(i)=(-16*m)/(i^2*pi^2);
   i = i+4;
   if i>N
       break
   end
end
% Create a vector of time instants
t = -2: 1/N/10 :6 ;
% Set the fundamental frequency.
T0 = 2;
omega = 2*pi/T0;
% Compute an approximation to signal using up to 10-th harmonic.
xtTEN = a0;
for i=1:10
   xtTEN = xtTEN + ak(i)*cos(i*omega*t);
end
% Compute an approximation to signal using up to 50-th harmonic.
k = 1:50;
ak= zeros(1,50);
i=2;
while true
   ak(i)=(-16*m)/(i^2*pi^2);
   i = i+4;
   if i>50
       break
   end
end
xtFIFTY = a0;
for i=1:50
   xtFIFTY = xtFIFTY + ak(i)*cos(i*omega*t);
end
% Compute an approximation to signal using up to 100-th harmonic.
k = 1:100;
ak= zeros(1,100);
i=2;
while true
   ak(i)=(-16*m)/(i^2*pi^2);
   i = i+4;
   if i>100
       break
   end
end
xtHUNDRED = a0;
for i=1:100
   xtHUNDRED = xtHUNDRED + ak(i)*cos(i*omega*t);
```

```
end
figure
subplot 311
plot(t, xtTEN, 'linewidth',1);
grid on;
xlabel('time','Fontsize',13);
ylabel('x10(t)','Fontsize',13)
title([num2str(10) ...
'-harmonic approximation to x(t)']);
subplot 312
plot(t, xtFIFTY, 'linewidth',1);
grid on;
xlabel('time','Fontsize',13);
ylabel('x20(t)','Fontsize',13)
title([num2str(20) ...
'-harmonic approximation to x(t)']);
subplot 313
plot(t, xtHUNDRED, 'linewidth',1);
grid on;
xlabel('time','Fontsize',13);
ylabel('x100(t)','Fontsize',13)
title([num2str(100) ...
'-harmonic approximation to x(t)']);
%% POSTLAB 6
```

SNAPSHOTS:



TASK 06

SNAPSHOT: