MATHEMATICAL MODELLING

TIDAL WAVE SIMULATION

LECTURER :

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ARRANGED BY :

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A. ASSIGNMENT DESCRIPTION

The objective of this assignment is to simulate the tidal wave in Matlab. We first consider the value of time as 1 and input some value of other variable (length of wave, height of wave, initial condition for position, and initial position for speed). Each value given to those variable is to find out how big their influence to the tidal wave.

B. MATLAB SOURCE CODE

```
L = str2num(get(handles.edit2,'String'));
u0 = str2num(get(handles.edit3,'String'));
ut0 = str2num(get(handles.edit4,'String'));
h = str2num(get(handles.edit5,'String'));

x=1;
t = 0:0.01:1;
g = 9.8;
n = [1 2 3];

an = zeros([1 3]);
bn = zeros([1 3]);
omega = zeros([1 3]);
u = zeros([3 length(t)]);

for i = 1:1:3
    omega(i) = n(i)*pi*sqrt(g*h)/L;
    bn(i) = u0/sin(n(i)*pi*x/L);
    an(i) = ut0/(omega(i)*sin(n(i)*pi*x/L));
    for j = 1:1:length(t)
        u(i,j) =
sin(n(i).*pi*x/L).*(an(i).*sin(omega(i).*t(j))+bn(i).*cos(omega(i).*
t(j)));
    end
end

axes(handles.axes1);

for i = 1:1:3
    plot(t,u(i,:)); hold on;
end

cla(handles.axes1);
for i = 1:1:3
    plot(t,u(i,:), 'linewidth', 1.15); hold on;
end

cla(handles.axes1);
for i = 1:1:3
    plot(t,u(i,:), 'linewidth', 1.15); hold on;
end

legend('n = 1','n = 2','n = 3');
xlabel('TIME','FontSize',10,'FontWeight','bold','Color','k');
ylabel('DEFLECTION','FontSize',10,'FontWeight','bold','Color','k');
handles.axes1.GridColor = 'k';

[x,t] = meshgrid(0:0.01:1);
```

```
k=1;
axes(handles.axes4);
title('n=1');
z =sin(k*pi.*x/L).*(an(k).*sin(omega(k).*t)+bn(k).*cos(omega(k)*t));
mesh(x,t,z);

k=2;
axes(handles.axes5);
legend('n=2');
z =sin(k*pi.*x/L).*(an(k).*sin(omega(k).*t)+bn(k).*cos(omega(k)*t));
mesh(x,t,z);

k=3;
axes(handles.axes6);
title('n=3');
z =sin(k*pi.*x/L).*(an(k).*sin(omega(k).*t)+bn(k).*cos(omega(k)*t));
mesh(x,t,z);

set(handles.edit7,'String',toc);
```

B. MATLAB SIMULATION

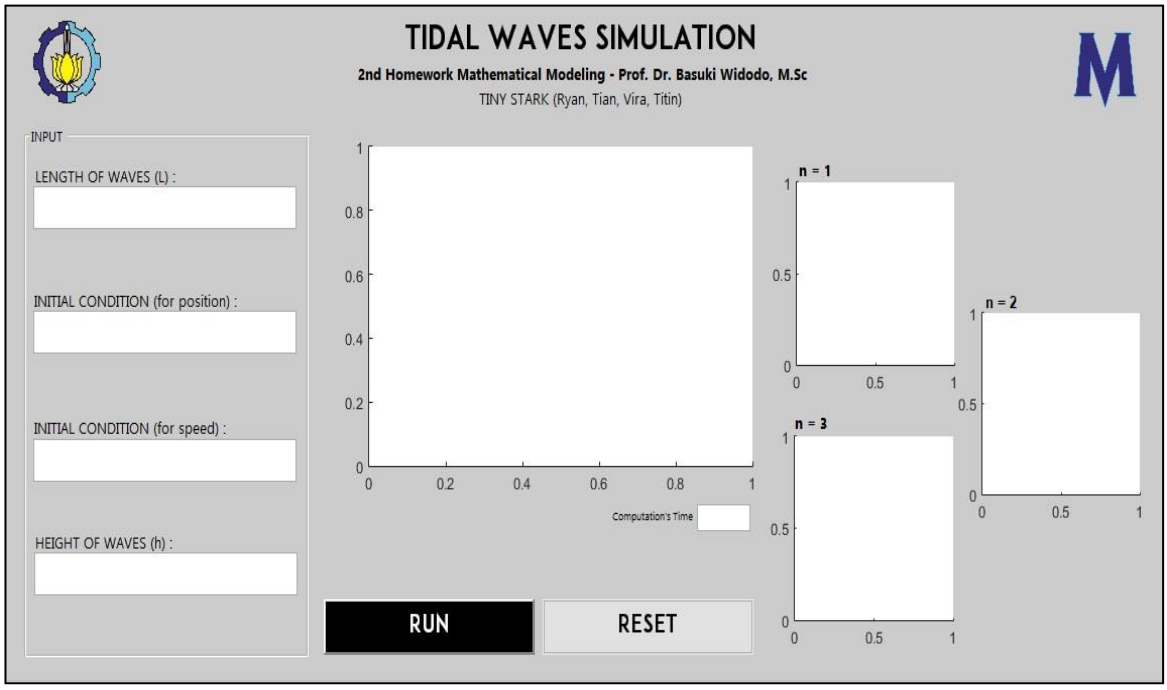

Figure 1. Interface of Tidal Wave Simulation

a. Tidal Wave Simulation with Different Length of Wave

Assume that the initial condition for position is 1, initial condition for speed is 1, and height of wave is 5. .

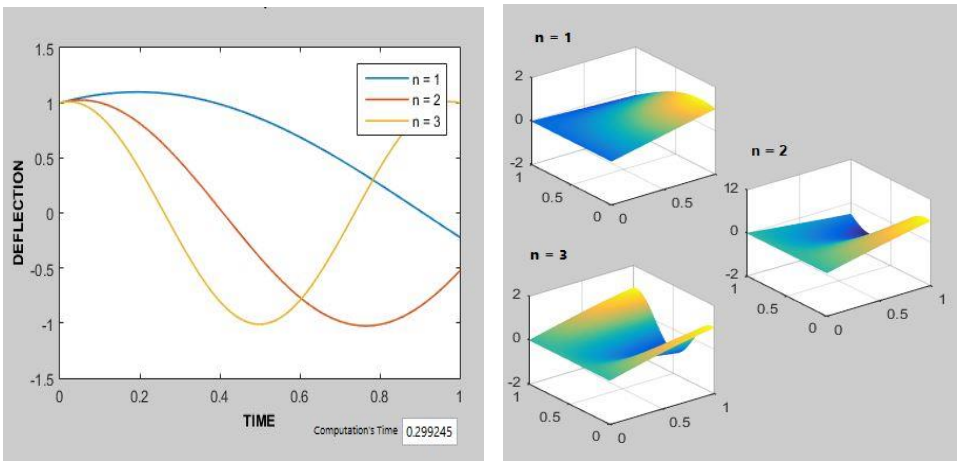

Figure 2. Tidal Wave Simulation with Length is 10

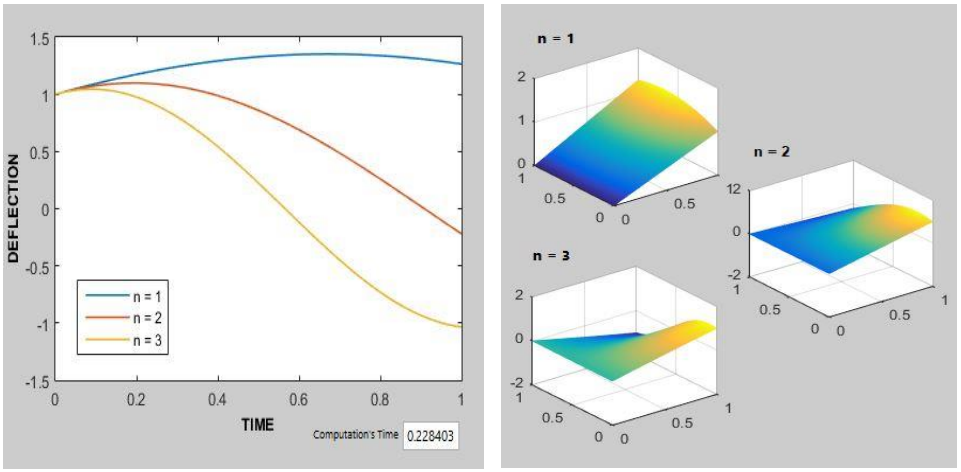

Figure 3. Tidal Wave Simulation with Length is 20

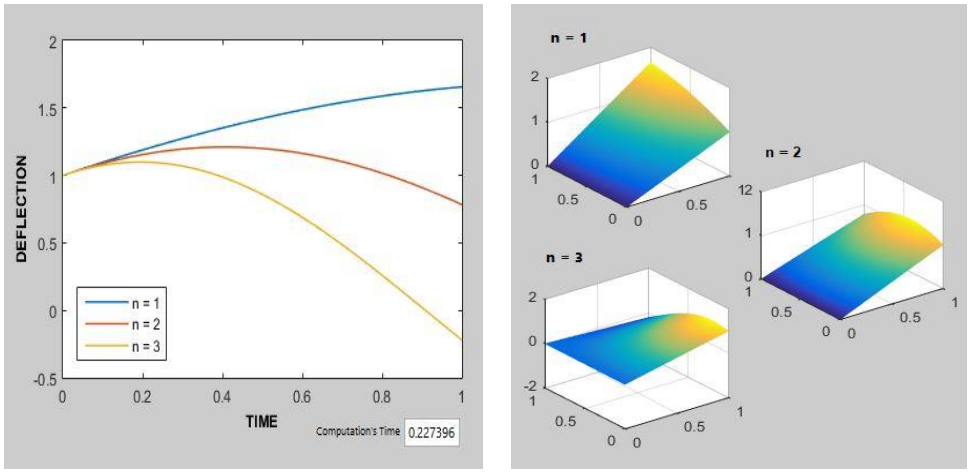

Figure 4. Tidal Wave Simulation with Length is 30

b. Tidal Wave Simulation with Different Initial Condition for Position

Assume that length of wave is 10, initial condition for speed is 1, and height of wave is 5.

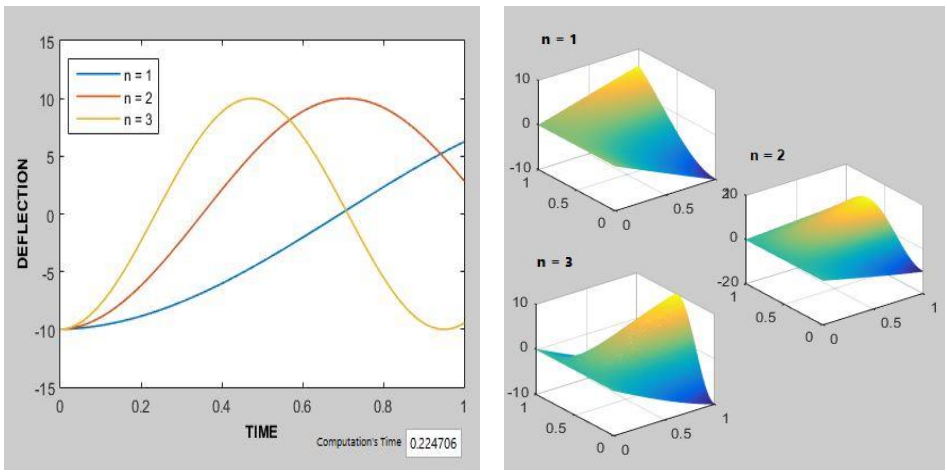

Figure 5. Tidal Wave Simulation with Initial Condition for Position is −10

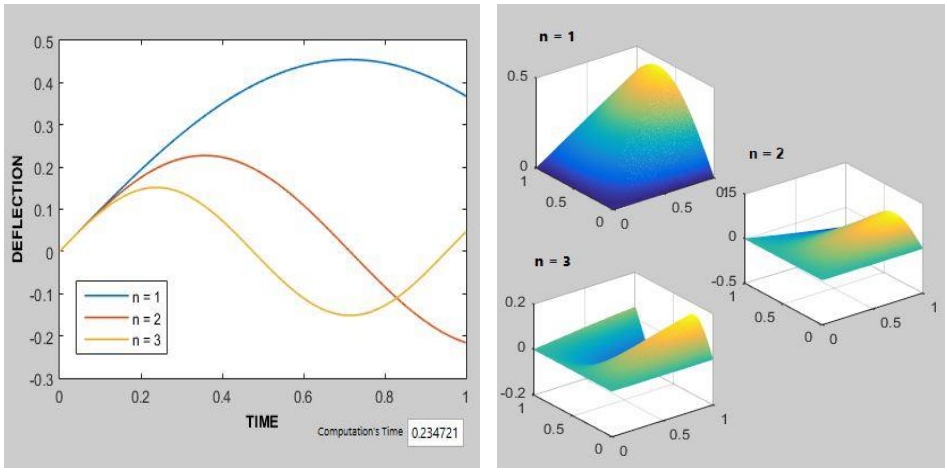

Figure 6. Tidal Wave Simulation with Initial Condition for Position is 0

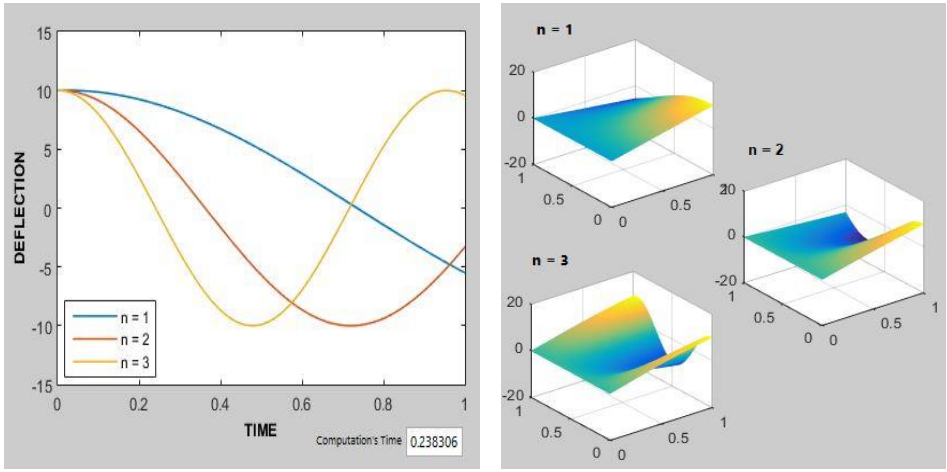

Figure 7. Tidal Wave Simulation with Initial Condition for Position is 10

c. Tidal Wave Simulation with Different Initial Condition for Speed

Assume that length of wave is 10, initial condition for position is 1, and height of wave is 5.

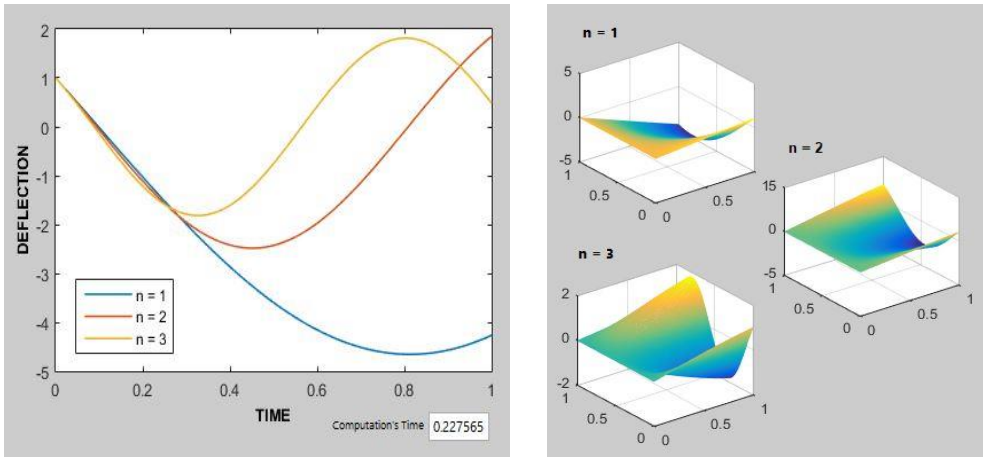

Figure 8. Tidal Wave Simulation with Initial Condition for Position is -10

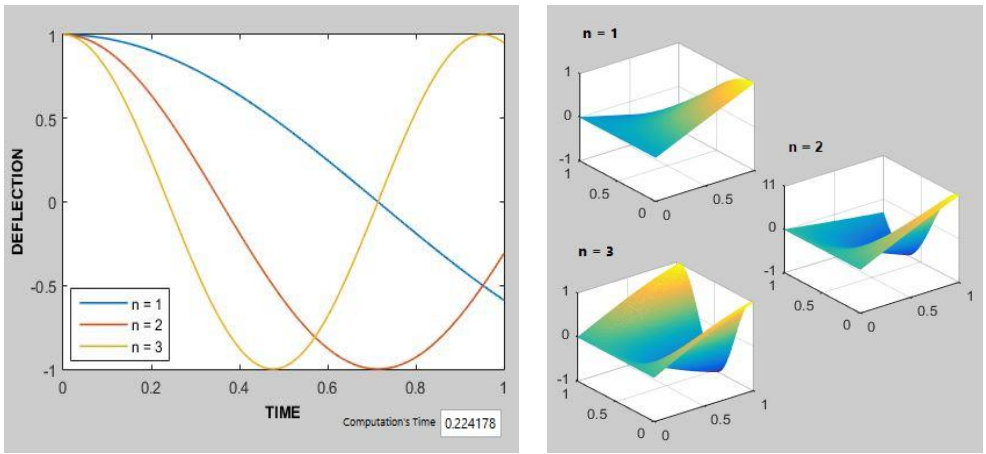

Figure 9. Tidal Wave Simulation with Initial Condition for Position is 0

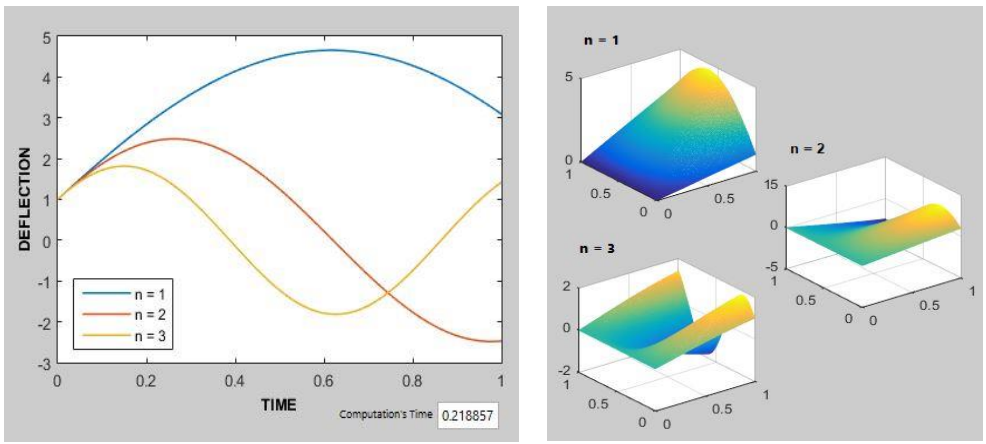

Figure 10. Tidal Wave Simulation with Initial Condition for Position is 10

d. Tidal Wave Simulation with Different Height of Wave

Assume that length of wave is 10, initial condition for position is 1, and height of wave is 1.

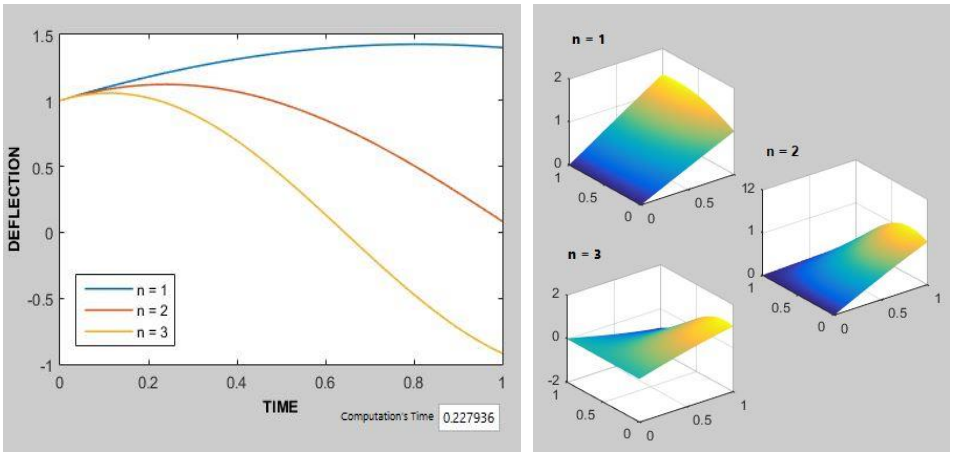

Figure 11. Tidal Wave Simulation with Height of Wave 1

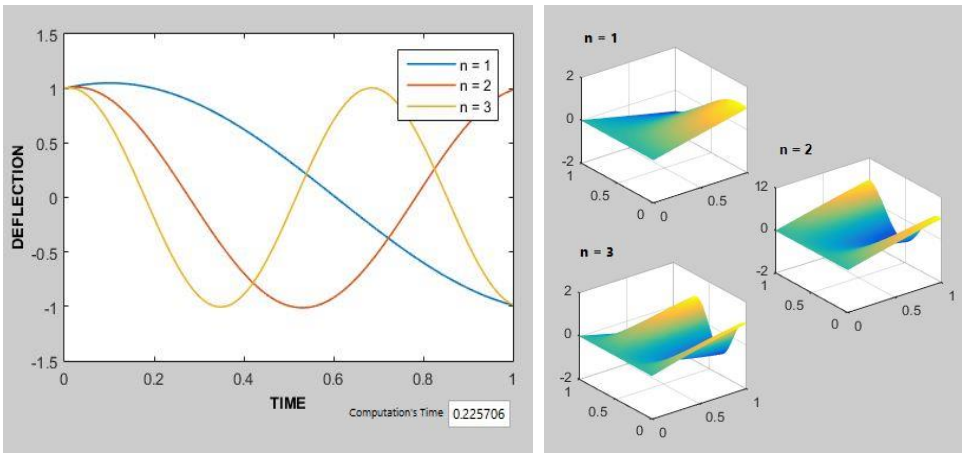

Figure 12. Tidal Wave Simulation with Height of Wave is 10

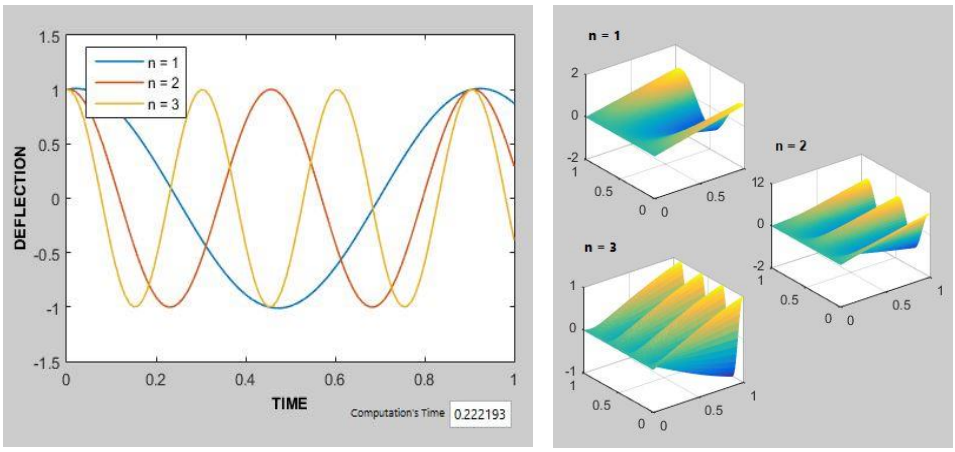

Figure 10. Tidal Wave Simulation with Height of Wave is 50