Name: Nusrat Hossain

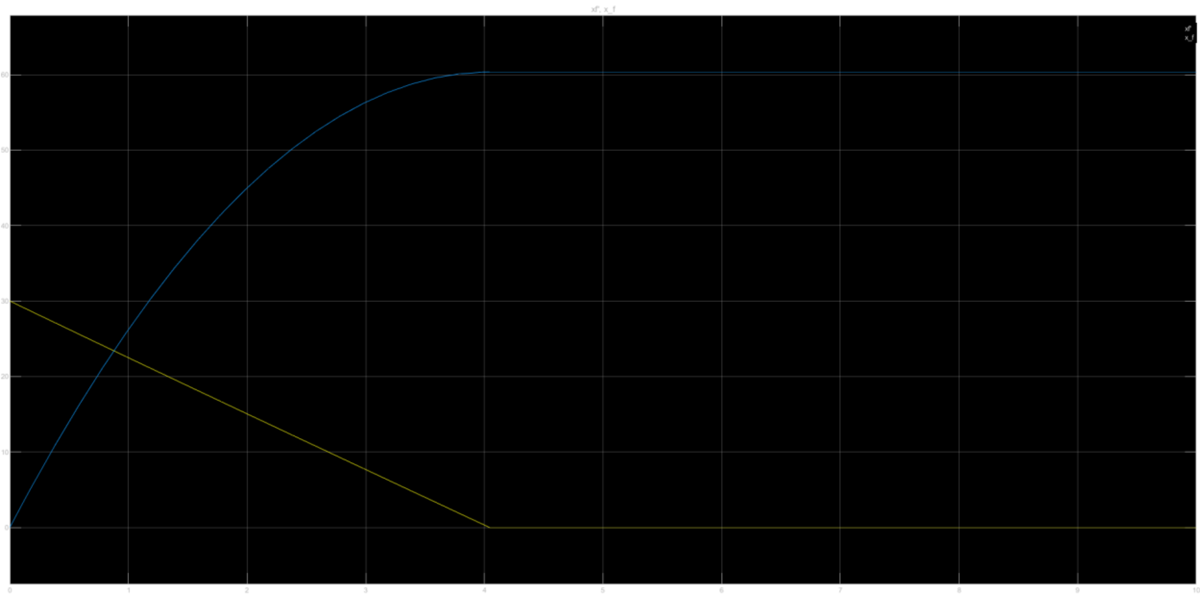
Report for Assaignment1_b

A) In the first design it just followed the equation. Here keeping initial condition of speed as 0 and braking moment is also 0. In this model it followed the instruction that the angular velocity of the wheel cannot become negative by using a limit in the integrator.

B) Assuming a high braking moment *MB* amounting to 5 500 Nm and an initial speed of 30 *m/s*

The car takes 4.04(approx.) seconds to stop.

The car stops at 60.34 meter.



This Figure shows how the model works after simulation.

C) For finding the value of lamda_max a MATLAB script is being used.

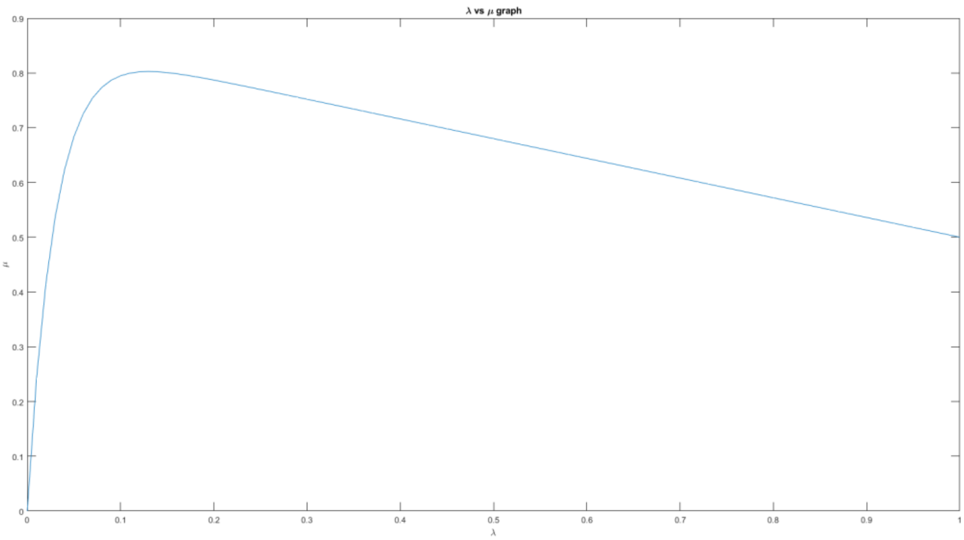
```
clear
clc
close all

mu = []; % variable for storing mu values
lamda_out = []; % variable for storing lamda values
%for storing the index this k is used
k = 1;
 %as the range for lamda is given
for lamda= 0:.01:1
    sim('a1bc1.slx','StopTime','10');
    mu (k) = ans.mu;  %this command is for getting the value from
matlab
    lamda_out (k)= lamda;
    k = k+1;
end

figure (1)
plot (lamda_out, mu)
xlabel ('\lambda')
ylabel ('\mu')
title ('\lambda vs \mu graph')

mu_max_pos = find(mu==max (mu));% finding the position for maximum
mu
lamda_max = lamda_out(mu_max_pos);% lamda_max from the maximum mu
position
```

Through this MATLAB scrip lamda_max is calculated. The value for lamda_max is 0.13 which can be found from below graph also.



This is lamda vs mu graph to calculate lamda_max.

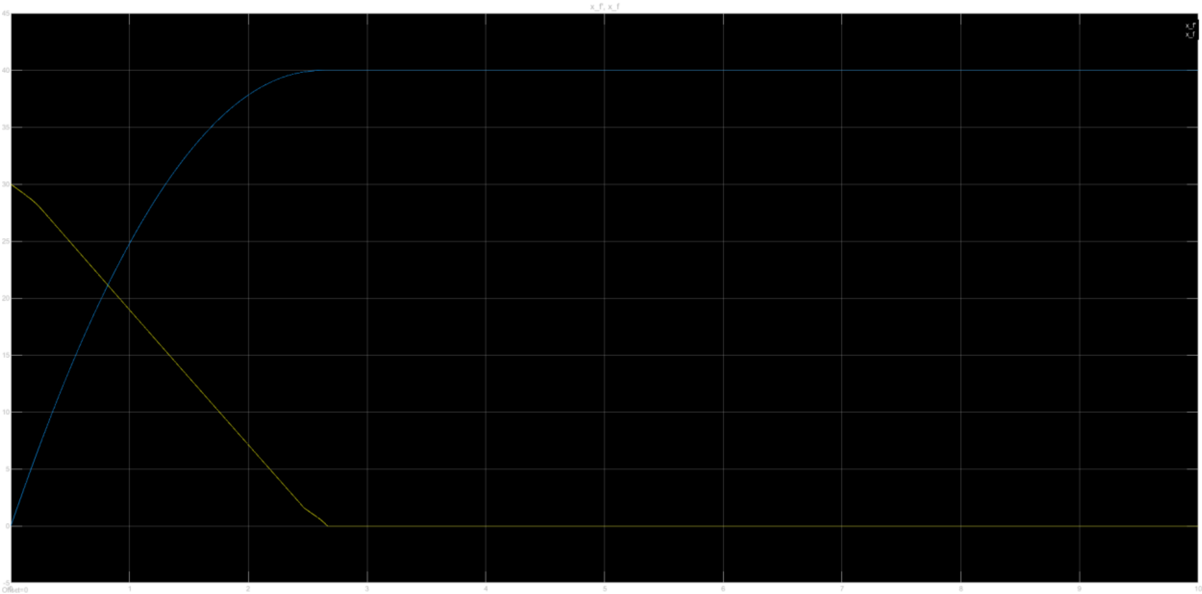
Nb: Please run the MATLAB script a1bc1_matlab.m file first to get the value of lamda_max

D) *Here a controller is designed according to the* the correction signal Δ*. It takes lamd_max and lamda as input* outputs a correction signal Δ which is added to the braking moment *MB.* An integration block is used to follow $\Delta(t)$ is the integral up to time t of a signal that is 20 000 when λ is too low and -20000 when λ is too high

E) By simulating the model assuming with the braking moment MB + Δ an initial speed of 30 m/s it shows that

The car takes 2.6657(approx.) seconds to stop.

The car stops at 40.02 meter.



This figure shows how the model works when a feedback controller is added to the model.