Vehicular Electronics HW2

2018324133 김태우

All code is written in matlab.

**2.3.(a)**

**Source with comment**

|  |
| --- |
| % Constants  m = 692;  C\_d = 0.2;  A\_f = 2;  C\_0 = 0.009;  C\_1 = 1.75e-6;  rho = 1.16;  g = 9.81; |

**2.3.(a).(i)**

**Source with comment**

|  |
| --- |
| % Zero Rolling Resistance -> F\_TR = F\_gxT  % F\_gxT = m\*g\*sin(beta)  beta = atan(0.15); % grade = 15%  F\_gxT = m \* g \* sin(beta);  % answer  F\_TR = F\_gxT |

**Answer**

|  |
| --- |
| F\_TR =  1.0070e+03 |

**2.3.(a).(ii)**

**Source with comment**

|  |
| --- |
| % Maximum force of F\_roll = ± C\_0 \* m \* g \* cos(beta)  % For keeping from rolling, net F must be zero  % F\_TR - F\_roll - F\_gxT = 0  % so F\_TR = F\_roll + F\_gxT  % Minimum force of F\_TR = m \* g \* sin(beta) - C\_0 \* m \* g \* cos(beta)  F\_TR = m \* g \* sin(beta) - C\_0 \* m \* g \* cos(beta) |

**Answer**

|  |
| --- |
| F\_TR =  946.5914 |

**2.3.(b).(i)**

**Source with comment**

|  |
| --- |
| beta = atan(-0.12); % grade = -12%  v = 0:0.1:80.5; % x parameter)  F\_gxT = m \* g \* sin(beta) ...% constant  + 0 \* v; % dummy zero for data size  F\_AD = 0.5 \* rho \* C\_d \* A\_f \* v.^2;  F\_roll = m \* g \* cos(beta) \* (C\_0 + C\_1 \* v.^2);  figure;  hold on;  plot(v, F\_gxT, 'DisplayName', 'F\_{gxT}');  plot(v, F\_AD, 'DisplayName', 'F\_{AD}');  plot(v, F\_roll, 'DisplayName', 'F\_{roll}');  hold off; |

**Answer**



FAD < Froll < FgxT

Froll < FAD < FgxT

Froll < FgxT < FAD

**2.3.(b).(ii)**

**Source with comment**

|  |
| --- |
| % For constant velocity, net F must be zero  F\_TR = - F\_roll - F\_gxT - F\_AD;  figure;  plot(v, F\_TR, 'DisplayName', 'F\_{TR}'); |

**Answer**



No. below 55.4m/s, the force towards to ongoing direction, and over 55.4m/s, it towards to opposite direction.

**2.5.(a)**

**Source with comment**

|  |
| --- |
| % Velocity profile  syms t;  V = 20 \* log(0.282 \* t + 1);    % F\_tr = F\_net - F\_roll - F\_AD  % F\_net = m \* dv/dt  F\_net = m \* diff(V);  F\_roll = m \* g \* (C\_0 + C\_1 \* V ^ 2);  F\_AD = 0.5 \* rho \* C\_d \* A\_f \* V ^ 2;  F\_tr = F\_net + F\_roll + F\_AD;  P\_tr = F\_tr \* V;    % Plot  fig1 = figure;  ezplot(F\_tr, [0, 10], fig1);  fig2 = figure;  ezplot(P\_tr, [0, 10], fig2); |

**FTR(t)**



**PTR(t)**



**2.5.(b)**

**Source with comment**

|  |
| --- |
| % e\_tr = integral 0 to 10 P\_tr  e\_tr = vpa(int(P\_tr, [0, 10]))  % KE = 0/5 \* m \* v^2  v = matlabFunction(V);  KE = 0.5 \* m \* v(10) ^ 2  % ratio of e\_tr / KE  ratio = KE / e\_tr  % Energy loss  loss = e\_tr - KE  ezplot(P\_tr, [0, 10], fig2); |

**Answer**

|  |
| --- |
| e\_tr =    275241.0020991429187856026604786    KE =  2.4860e+05    ratio =    0.90322274493096343128836092463888      loss =    26637.068665605983886436434091579 |