

pb1	함수입출력(2), 초기값(1), dv/dt계산(2), v,t계산(3), 최종결과(2), ppt미첨부(-1)
pb2	ODE 함수 정의(3), 높이0시간 계산(3), plot옵션(2), text출력(2), A(h)보간(2), dh/dt계산(3), ppt미첨부(-1)
pb3	1) 초기값(1), mid pnt. method(4), 이론해(1), 수치해(1), plot옵션(3), ppt미첨부(-1) 2) error계산(2), max error(2), 종료조건(3)
pb4	OCV, Ke, R, L, Kt, J 선언(각2점, 적절히 반영되어야함), I계산(5), RPM계산(5), V계산(2), 5초 시뮬레이션(1), ppt미첨부(-1)
pb5	1) Parameter선언(3), APS(1), 토크맵(3), 모터속도센서(1), 모터관성(1), 클러치(1), 액추에이터(1), 기어(2), 차량관성(1), 차량관성속도센서(1), 공기저항(2), 구름저항(2), 저항토크(2), 가속시간(2), 최대차속(2), ppt미첨부(-1) 2) 표작성(4, 2개 틀릴때마다 -1), 기어비영향(2), 질량영향(2)
timeover	초과 2분당 -1점

1.

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function vend = velocity (ti,tf,vi,dt)
% input:
%   dt = time step (s)
%   ti = initial time (s)
%   tf = final time (s)
%   vi = initial value of dependent variable (m/s)
% output:
%   vend = velocity at final time (m/s)
%% initial values
t = ti;
v = vi;
n = (tf - ti)/dt;
%% cal. v,t
for i = 1:n
    dvdt = deriv(v);
    v = v + dvdt * dt;
    t = t + dt;
end
vend = v;
end
%% cal. dv/dt
function dv = deriv (v)
dv = 9.81 - (0.25/68.1) * v * abs(v);
end

```

2. refer to the homework solution (3rd week)

3.

(1) refer to the lecture (midpoint's method in ODE)

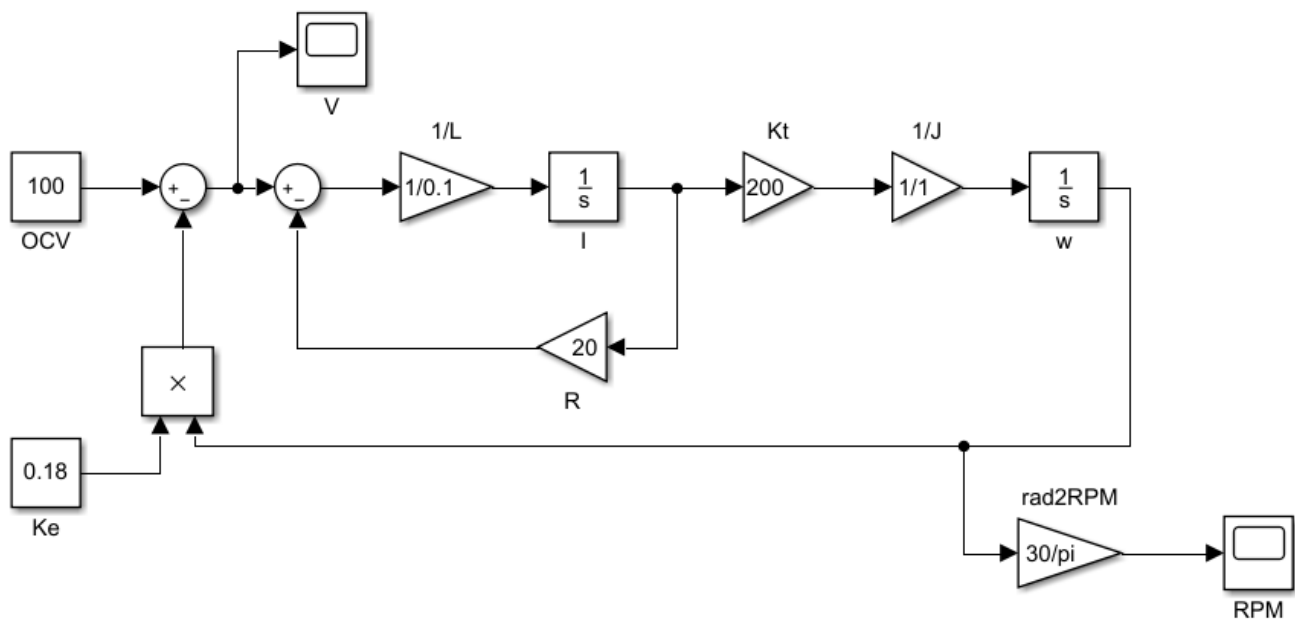
(2)\

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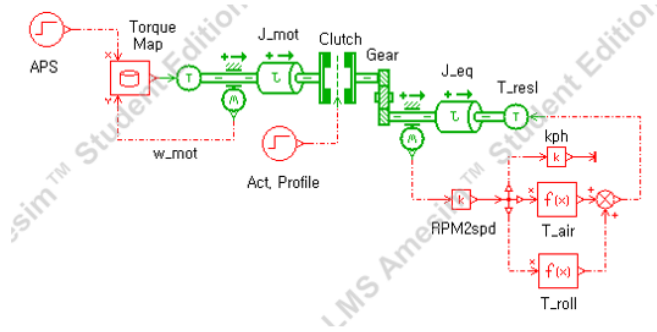
clear all; close all;
h=20; % initial step size
max_error=100; % initial error (assumed)
while max_error>1 % terminal criterion
%% analytic solution
t_a = [0:h:200]';
y_a = 400-360*exp(-0.025*t_a);
%% numerical solution
dydt = @(t,y) 10-0.025*y;
[t_n,y_n] = midpoint(dydt,[0,200],40,h);
%% cal. error
error=abs(y_a-y_n)./y_a*100;
max_error=max(error(2:end));
h=h-0.1 % decrease of step size
end
max_error % print final error

```

4.



5.



Time / Speed	GR=5	GR=6	GR=7
m (-20%)	7.07 / 180.97	6.11 / 150.81	5.55 / 129.27
m (0%)	8.88 / 180.97	7.64 / 150.81	6.93 / 129.27
m (+20%)	10.70 / 180.97	9.21 / 150.81	8.34 / 129.27

Gear ratio ↑ : acceleration time ↓ , maximum speed ↓

↓ : acceleration time ↑ , maximum speed ↑

Vehicle mass ↑ : acceleration time ↑ , ↓ : acceleration time ↓ (no effect on maximum speed)