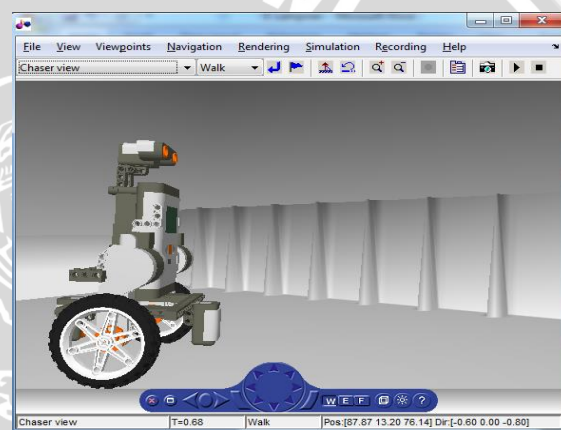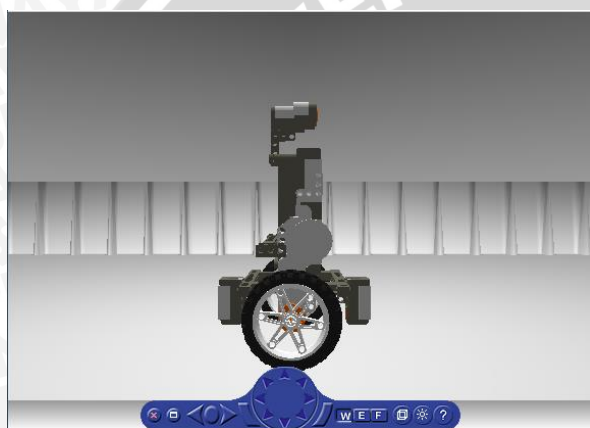# LAMPIRAN I

VISUALISASI 3D

(a)   (b)

Gambar 1. (a) Tampak Samping , (b) Tampak Depan

LAMPIRAN II

LISTING PROGRAM

DEFINIS PARAMETER MOTOR

```
function Torque  = Motor(Y_dot, v_l, v_r)

%Constant
n = 9.7;
R = 0.125;
W = 0.5;
f_m = 0.05;

Rm = 1.468;
Kt = 0.5588;
Kb = 0.0566;

%Formula
theta_dot = Y_dot(1,1);
psy_dot = Y_dot(2,1);
phi_dot = Y_dot(3,1);

alpha = n*Kt/Rm;
beta  = n*Kt*Kb/Rm + f_m;

T_theta =  alpha*(v_l + v_r) - 2*beta*(theta_dot - psy_dot) -
2*f_m*theta_dot;
T_psy   = -alpha*(v_l + v_r) + 2*beta*(theta_dot - psy_dot);
T_phi   =  W/(2*R)*alpha*(v_r - v_l) - W^2/(2*R^2)*beta*phi_dot;

Torque = [T_theta T_psy T_phi];
```

DEFINISI PARAMETER ROBOT

```
function Y_2dot = Robot(Y_dot, Y, T)

%Constrant
g=9.81;
m=5*2;
M=90;
n=9.7;
R=0.125;
L=0.9;
W=0.5;
J_psy=0.3063;
J_phi=0.9313;
J_w=0.039;
J_m=0.0;

cfc = 0.0;  % cfc - coulomb friction coefficient
vfc = 0.0;  % vfc - viscous friction coefficient

%Formula
T = T - vfc*Y_dot - cfc*sign(Y_dot);
```

```
theta = Y(1,1);
psy = Y(2,1);
phi = Y(3,1);

theta_dot = Y_dot(1,1);
psy_dot = Y_dot(2,1);
phi_dot = Y_dot(3,1);

a_11 = (2*m + M)*R^2 + 2*J_w + 2*n^2*J_m;
a_12 = M*L*R*cos(psy) - 2*n^2*J_m;
a_21 = M*L*R*cos(psy) - 2*n^2*J_m;
a_22 = M*L^2 + J_psy + 2*n^2*J_m;
a_33 = 0.5*m*W^2 + J_phi + W^2/(2*R^2)*(J_w + n^2*J_m) +
M*L^2*(sin(psy))^2;

b_1 = -M*L*R*psy_dot^2*sin(psy);
b_2 = -M*g*L*sin(psy) - M*L^2*phi_dot^2*sin(psy)*cos(psy);
b_3 = 2*M*L^2*psy_dot*phi_dot*sin(psy)*cos(psy);

A=[a_11 a_12 0;a_21 a_22 0;0 0 a_33];
B=[b_1;b_2;b_3];

Y_2dot = inv(A)*(T-B);
```
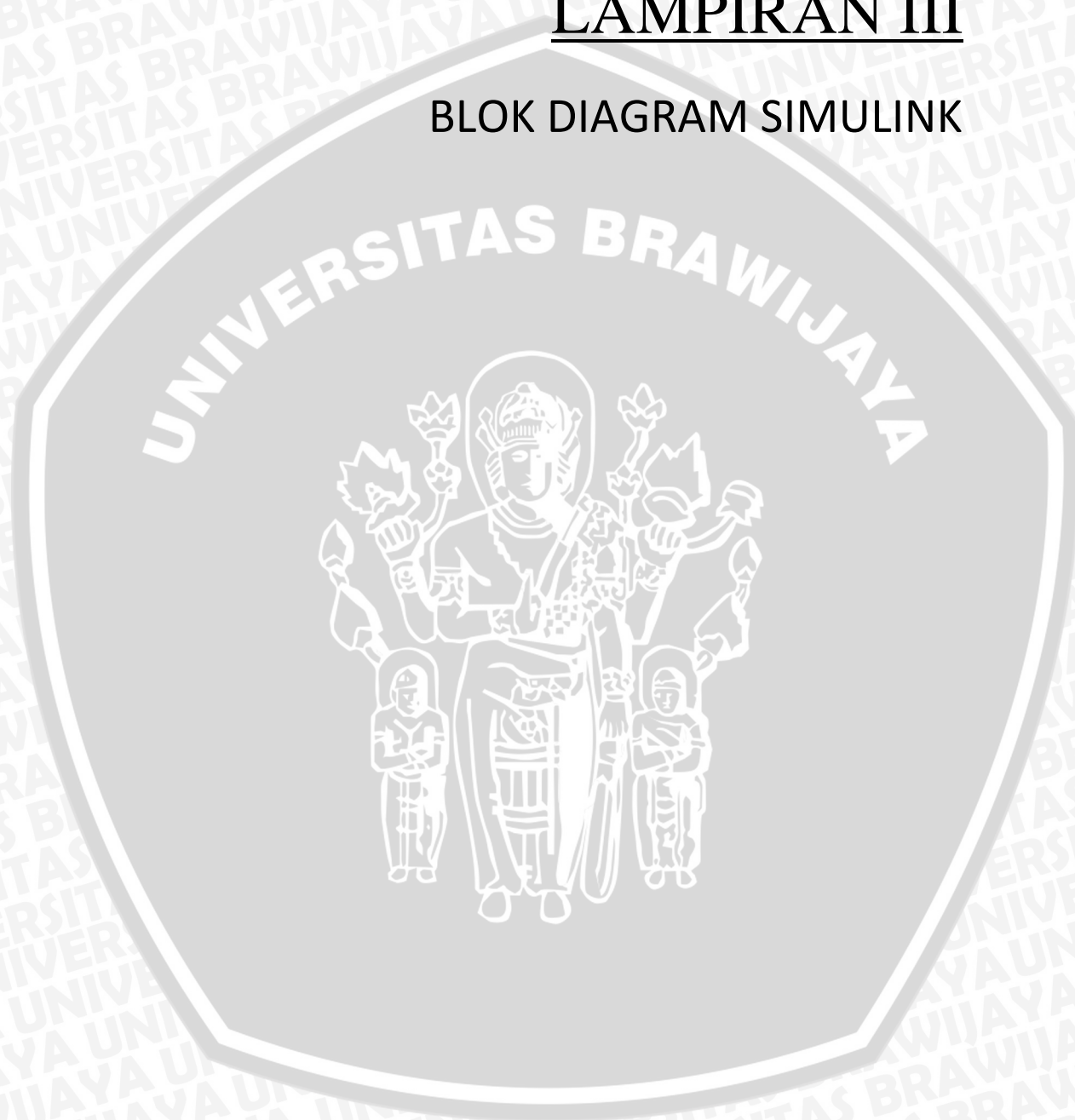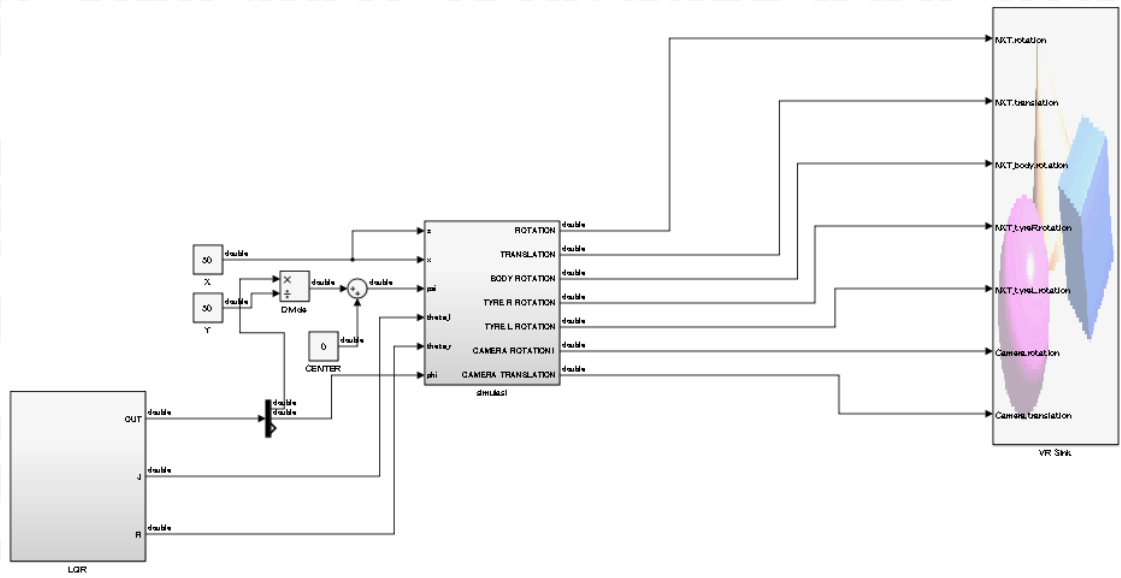
LAMPIRAN III

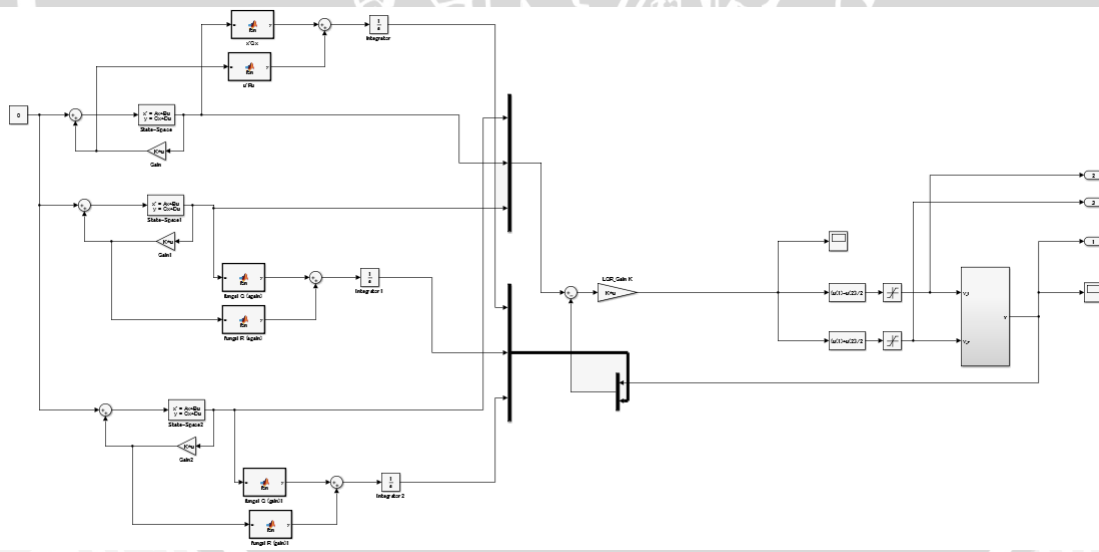## BLOK DIAGRAM SIMULINK

PLANT KESELURUHAN

PLANT PERANCANGAN LQR

PLANT ROBOT