

# 1 System Modeling

Insert sketch of pendulum including indication of positive direction of angle  $\theta$  and where it is zero.

## 1.1 Model of One-Degree of Freedom Robot

Model of system based on physics.

## 1.2 Linearized Model of Robot

Linearized model - both in time-domain and frequency-domain.

# 2 Performance Specification

## 2.1 Time-Domain

## 2.2 Frequency-Domain

# 3 Controller Design

## 3.1 Design of PID Controller

Use the root locus method to design the controller. Show all root locus plots leading to the final design

## 3.2 Step Response of Linearized System

Insert step response showing both output  $y$  and control signal  $u$ .

# 4 Simulation

## 4.1 Simulation of Linearized System Model

Insert simulation results showing both output  $y$  and control signal  $u$ .

## 4.2 Simulation of Nonlinear System Model

Insert simulation results showing both output  $y$  and control signal  $u$ .