

**Instruction:** Hand in your work in the mail box labeled INC691 by 4 pm. or submit it via email. DO NOT copy homework from your classmates or lend it to others. Anyone who violates this regulation will be given zero for the homework.

**Important:** This homework is considered as a first part of the midterm project. Every student who register to the course have to do and submit this homework in time to get the points.

A rotary dryer for sugar beets is shown in Figure 1. The input to the process is the amount of fuel supplied,  $\dot{m}_F \in [-5, 5]$  kg/s, and the output is the amount of dry matter,  $\psi_{DM} \in [-15, 15]$  unit. A Simulink files can be downloaded from <http://staff.kmutt.ac.th/~sudchai.boo/Teaching/inc691/homework.html>.



Figure 1: Rotary Dryer

1. Design your own sampling rate and excitation input signals. Explain the details of your design. Excite the system (Simulink model) and collect the sampled data. **(10 points)**.
2. Identify a linear model of the rotary dryer by the collecting data from part 1 in ARX model structure. Explain about the quality of your constructed model **(10 points)**.
3. Determine the covariance matrix  $P_\theta$  **(5 points)**.