Prince of Songkla University
Department of Industrial Engineering, Faculty of Engineering

Mid Term Examination: Semester 1   Academic Year: 2007
Date: 28 July 2007   Time: 13:30 – 16:30
Subject: 225-716 Comp. Simulation with ProModel   Room: R300

ทุจริตในการสอบ โทษขั้นต่ำ คือ ปรับตกในรายวิชาที่ทุจริต และพักการเรียนหนึ่งภาคการศึกษา
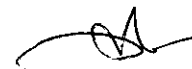
Instructions: Read carefully
1. All materials are allowed.
2. There are 4 questions. Do all of them. Also show your answer clearly and legibly.
3. Answer the questions in this test paper, only.
4. You must write your name and your student ID in every page of the test.
5. Total score is 100 points.

Distribution of Score

Problem	Points	Points Gained
1	20	
2	30	
3	10	
4	40	

Tests are prepared by
Nikorn Sirivongpaisal

Problem 1: (20 points) A simple manufacturing system consists of a storage station, a workstation _1, a workstation_2, an inspection station, and a packing station, as shown in Figure 1. Maximum capacity of the storage is 100 units, while 10 units are maximum capacity of a packing station. The rest of the system has only 1 unit for capacity. There is one part named "Side" that arrives to the storage every 300 minutes and 60 units in quantity for each arrival. Processing time of the "Side" at workstation _1 and workstation_2 is 5 and 6 minutes, respectively. After being processed at workstation_2, the 4 units of "Side" changes to "Desk", and goes for inspection and packing. Inspection takes 3 minutes and packing takes 4 minutes. The movement of parts between stations takes 1 minute.

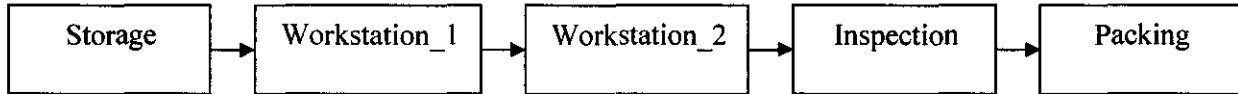| Storage	→	Workstation_1	→	Workstation_2	→	Inspection	→	Packing

Figure 1. Manufacturing System

Create simulation model by using ProModel to study the above manufacturing system. And run your model with 160 hours run length. After finishing running your model, answer these following questions.

(a) Examine the output results and identify system bottlenecks, also explain your reasons why?

(b) How many "Desk" does produce per hour at workstation_2? And how many "Side" does accumulate per hour at storage station?

(c) How many "Desk" does the system totally produce per hour?

Problem 2: (30 points) A small production line consists of a machining center and inspection station in series, as shown in Figure 1. Unfinished parts arrive to the location Queue1 with the characteristic of Poisson distribution with mean 3 pieces every 15 minutes. Processing times at the machining center are distributed as exponential random variable with mean 2 minutes, and subsequent inspection times per piece at the inspection station are distributed as uniform random variable with minimum time 2 minutes and maximum time 4 minutes. Eighty percent of inspected parts are "accepted" and are sent to shipping. Twenty percent are "rejected" and are sent back to Queue1 for rework.
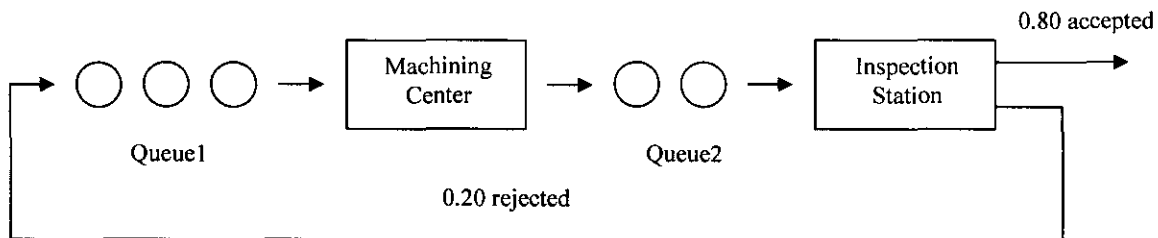

Figure 1.

Create simulation model to study the above system. Your model has to be constructed under these following requirements:

1. The capacity of Queue1 is 10 and the capacity of Queue2 is 20.
2. Use variables to collect the quantity of accepted parts, the quantity of rejected parts.

Run your model 5 times with 150 hours warm-up period and 84 hours run length. Then answer these questions:

(a) What is 95% confidence interval for the average of "accepted" parts produced from this production line?

(b) Identify what location is the bottleneck of this production line.