Faculty of Engineering

Prince of Songkla University

Midterm Examination : Semester 1                    Academic year 2006 ( 2549 )

Date : August 3 , 2006 ( 3 สิงหาคม 2549 )              Time : 13:30 – 16:30

Subject : 225-352  Operations Research              Room : R200

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ทุจริตในการสอบ โทษขั้นต่ำ ปรับตกในวิชาที่ทุจริตนั้น
และพักการเรียน 1 ภาคการศึกษา

Instruction:

1.    Total 4 topics, 17 pages, and 52 scores.

2.    Do your examination in these papers and return all of them.

3.    Write down your Name, Surname, Student code in every page.

4.    Show all calculation and assumption.

5.    All books, notes and calculators are allowed but you are not permitted to borrow anything from the others.

|       | Score | Your Scores |
|-------|-------|-------------|
| 1     | 12    |             |
| 2     | 10    |             |
| 3     | 15    |             |
| 4     | 15    |             |
| Total | 52    |             |

No...........................................................................
( From the number in examination list )
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Surname..................................................................
Student Code..........................................................
Year........................................................................
Department.............................................................

Assistant Professor Yodduang PANNARA

Name ...........................................Surname ..............................Student Code.........................

1.    Describe or Calculate all the problem with clear statement

    1.1    From Figure 1.1, calculate the striped area. ( 1.5 scores )



        Figure 1.1

    1.2    The manager says the inventory must be maximized to make the best benefit. Do you agree
with this concept ?   Why ?  ( 1.5 scores ).................................................................

    1.3    In Queuing theory, describe the meaning of  M/D/7/6/SIRO.   What do you think about this
system? ( 1.5 scores )...............................................................................

    1.4    What is the meaning of system environment ?  Why do we have to pay attention to system
environment ?  ( 1.5 scores )........................................................................

Name ……………………………………Surname …………………………………Student Code……………………

1.5 If you are an industrial engineer, when you have the problems that are hard to be solved. Which subject or technique would you select to help you get through them and why? ( 1.5 scores )

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1.6 What is the purpose of each method to collect the data?  If you have to collect the inventory data, what technique would you select and what is the reason?  ( 1.5 scores )

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1.7 Describe the meaning of transient period and steady state period.   What are the different between both of them?  ( 1.5 scores )………………………………………………………………………

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1.8 What is the meaning of "Implementation the model" and how it can be beneficial? ( 1.5 scores )

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( Total 12 scores )

2. The buregerhouse sells burger. The selling price is 50 Baht/piece. The variable cost of burger is
$2(\text{Selling Price})^{\frac{1}{2}}$ - Y + 6 Baht/piece

Y is the parameter

- If the amount of selling burger is between 1 and 80 pieces/day, Y is equal to -5 Baht/piece
- If the amount of selling burger is > 80 pieces / day,   Y is equal to 1      Baht/piece
- If the amount out of selling burger is 0 piece/day,      Y is equal to 20.14214 Baht/piece

Example :

- If you sell burger 70 pieces/day,         $Y = 2(50)^{\frac{1}{2}}$ - ( -5 )+ 6 = 25.14214 Baht/piece

Each day the burgerhouse has the fixed cost 1,500 baht/day. ( If the burgerhouse sells nothing, it must pay 1,500 baht/day )

Use your simple logic and / or show all calculation about selling burger.

2.1    Suppose the maximum burger sales per day are 270 pieces. Draw the graph or calculate the relation between fixed cost and volume of selling burgers from 0 piece to 270 pieces ( 1 score )

2.2    What is the maximum capacity selling of burgerhouse for each day? How much ?
( 1 score )

2.3    Suppose the maximum burger sales per day are 110 pieces. Draw the graph or calculate the relation between profit and volume of selling burgers from 0 piece to 110 pieces. ( 5 scores )

2.4    **Concern only variable cost.** How many pieces per day can you make minimum profit per piece for selling burger ? How much? ( 1.5 scores )

2.5    **Concern only variable cost.** How many pieces per day can you make maximum profit per piece for selling burger ? How much? ( 1.5 scores )

( If you draw the graph in plain paper, the scale should be approximately close to the fact )

( 10 scores )

Name …………………………………Surname …………………………Student Code…………………….

3. The buses arrive at the station according to deterministic distribution with mean of 15 buses per hour. The service time is in figure 3.1. Please calculate and/or explain and/or draw the graph for the problems below.

3.1 If the maximum numbers of buses in the station are unlimited, when does the steady state period start (1 score )

3.2 The maximum numbers of buses in the station are 3 buses. When does the first balk happen? ( 2 scores )

3.3 The maximum numbers of buses in the station are unlimited. When does the first balk happen? ( 1 score )

3.4 The maximum numbers of buses in the station are 3 buses. When does the steady state period happen? ( 2 scores )

3.5 Suppose there are 4 buses in the station when the system starts ( time=0 ). If the maximum numbers of buses in the station are 7 buses. When does the first balk happen? ( 2 scores )

3.6 Suppose there is 0 bus in the system when the system starts ( time=0 ), If the maximum numbers of buses in the station are 50 buses. When does the first balk happen? ( 3 scores )

3.7 Suppose there are 6 buses in the station when the system starts ( time=0 ), If the maximum numbers of buses in the station is unlimited, when does the steady state period happen? ( 1 score )

3.8 If the maximum numbers of buses in station are 3 buses, show the graph.

3.8.1 Buses come and leave the station within 0 to 70 minutes. ( 1 score )

3.8.2 Show the numbers of buses in the station within 0 to 70 minutes ( 1 score )
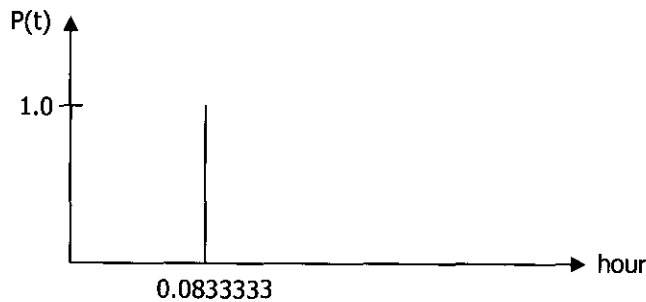
3.8.3 When does the steady state happen? ( 1 score )



Figure 3.1

( If you draw the graph in plain paper, the scale should be approximately close to the fact )

( 15 scores )

Name .......................................Surname ...........................Student Code........................

4.  AIS ( Awful Information Society ) wants to buy the telephone system to use in Shin country.

The service must be on time. There are 5 systems to select.

1$^{st}$ system

The price is 100,000,000 Baht.  This system has 1 processor and capacity to service with mean

8,000 times per minute.  The service time distribution is Exponential distribution.

2$^{nd}$ System

The price is 160,000,000 Baht . This system has 5 processors and total capacity to service with

mean 180 times per second.  The service time is Erlang distribution type 3

3$^{rd}$ System

The price is 200,000,000 Baht.  This system has 1 super processor.  It can service 14,000 times

per minute. The service time is deterministic distribution.

4$^{th}$ System

The price is 60,000,000 Baht.  This system has 4 processors.  The average time for each

processor to service is 1,500 times per minutes-processor.  The processors are paralleled.  The

service time for each processor is poisson distribution.

5$^{th}$ System

This system composes of two sets of 1$^{st}$ system but the price is 180,000,000 Baht. The services

are paralleled.  The efficiency of each channel decreases 5%.  Each channel can service average

7,600 times per minute.  The service time of each channel is exponential distribution.

The life time of every system is 10 years,  365 working days a year and 24 operating hours a day.

The arrival time is exponential distribution with mean 108 times per second.

Each time the system processes,  the cost is 2 Baht per transaction.  The cost of waiting time in

queue is 0.45 Baht per second.

Compare all systems.  What system do you select and why?

( 15 scores )

( Assistant Professor Yodduang PANNARA )