PRINCE OF SONGKLA UNIVERSITY
FACULTY OF ENGINEERING

Final Examination : Semester 2   Academic Year : 2006
Date : 25 February 2007   Time : 09.00-12.00
Subject : 225-501 Systems Simulation   Room : R 201
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ทุจริตในการสอบโทษขั้นต่ำ คือ ปรับตกในรายวิชาที่ทุจริต และพักการเรียน 1 ภาคการศึกษา

INSTRUCTIONS:

*1. There are 6 questions in this examination paper. The marks allocated
to individual questions are clearly stated before each question.
2. Answer all questions in the answer book(s) provided.
3. Begin the answer to each question on a new page.
4. Books, dictionaries and calculators are allowed.*

Asst. Prof. S. Taungbodhitham
Instructor

1. (5 Marks) Describe the circumstances under which simulation **is not** the appropriate tool in operations research and systems analysis.

2. (5 Marks) Use the multiplicative congruential method to generate a sequence of five two-digit random numbers with $X_0 = 65$, $a = 11$, $c = 0$, $m = 100$ when X_0 is the seed, a is the constant multiplier, c is the increment, and m is the modulus.

3. (5 Marks) Lead times have been found to be exponentially distributed with mean 3.0 days. Generate five random lead times from this distribution using the following uniform random numbers:

.94   .73   .70   .82   .25

4. (10 Marks) System data for *PSU IE job shop* revealed that the average time spent by a job in the shop was approximately 4 working days. The model made the following predictions on seven independent replications, for average time spent in the shop:

3.83 4.13 4.35 4.21 3.70 4.32 4.05

Conduct a statistical test to determine if model output is consistent with system behavior. Use a level of significance of $\alpha = 0.05$.

5. (15 Marks) Stock is examined at the end of each 5-day week and if it has declined to a level of six parts or less, an order is placed for ten units. Each order is delivered in accordance with the probability distribution shown in the table below (days till delivery are working days). When the simulation begins, it is the beginning of a week, there are 10 parts on hand and no orders are outstanding. Simulate 5 weeks of operation and estimate the mean units in ending inventory.

Daily Demand	Probability	Days till Delivery	Probability
0	0.30	2	0.10
1	0.36	3	0.50
2	0.22	4	0.30
3	0.09	5	0.10
4	0.03		

TURN OVER

3	17	21.1
4	10	19.2
5	8	14.0
6	7	8.5
7	5	4.4
8	5	2.0
9	3	0.8
10	3	0.3
11	1	0.1

6. (10 Marks) An experiment reported in *IE Formula II*, in 2006, presented the vehicle-arrival data at *Hat Yai Square Bus Terminal*. The histogram of the data appeared to follow a Poisson distribution. The probability mass function for Poisson distribution was used to calculate the probabilities associated with various values of x, the number of arrivals in a 5-minute period. With this information, the following table is constructed.

Arrivals per period x	Observed Frequency O_i	Expected Frequency E_i
0	12	2.6
1	10	9.6
2	19	17.4
3	17	21.1
4	10	19.2
5	8	14.0
6	7	8.5
7	5	4.4
8	5	2.0
9	3	0.8
10	3	0.3
11	1	0.1

Use the chi-square test at α = 0.01 to determine whether the distribution of the vehicle-arrival data is Poisson distribution.

END OF QUESTION
-GOOD LUCK-