MATH 244 (L2)

Applied Statistics

Mid-Term Examination

October 26, 2001

Time allowed : 90 minutes Answer all questions.

1. (*25 marks*) The following data are the energy consumptions (in 100kWh) of 20 households in a specific month.

	5.6	6.3	6.4	6.6	6.7	6.9	7.0	7.0	7.2	7.3	
	7.4	7.5	7.6	7.6	7.7	7.9	7.9	8.2	8.2	8.4	
(a)	Constru	uct a ste	em-and-	leaf dis	play for	the dat	a.				(6 marks)
(b)	Is the d	listribut	ion sym	metric,	positiv	ely skev	ved, or	negative	ely skev	ved?	(4 marks)
(c)	Find th	e five n	umber s	summar	y.						(10 marks)
(d)	Sketch	a box-p	olot for	the data	•						(5 marks)

- (25 marks) The daily power demand in a moderate sized city follows a normal distribution. The expected daily power demand is 15 million kilowatt hours (MKWH), and the variance is 4 MKWH². Suppose that the demands for power are independent from day to day.
 - (a) What is the chance that the demand for a given day exceeds 17 MKWH? (5 marks)
 - (b) A day with power demand exceeding 17 MKWH is considered to be a (7 marks) high power demand (HPD) day. What is the probability that there will be at least 30 HPD days in six months? (Assume 1 month = 30 days.)
 - (c) Suppose that the local power corporation has an unlimited supply of (7 marks) power, and that revenues are based on \$0.015 per kilowatt-hours. Find the probability that the TOTAL revenue for the power corporation in the next six months will be greater than 40 million dollars.
 - (d) If the normal assumption is violated (i.e. the actual distribution of daily (6 marks) power does not follow a normal distribution), will the calculations in (a),
 (b) and (c) still be valid? Explain briefly.

P. T. O.

- 3. (*10 marks*) Three machines I, II and III manufacture 30%, 30% and 40%, respectively, of the total output of certain items. Of them, 4%, 3% and 2%, respective, are defective. One item is drawn at random, tested and found to be defective. What is the probability that the item was manufactured by (a) machines I, (b) machine II, (c) machine III?
- 4. (*10 marks*) Suppose that the time for a student to finish a statistics examination is a gamma random variable with mean 90 minutes and standard deviation 15 minutes.
 - (a) What are the values of the parameters α and λ ? (5 marks)
 - (b) How long should the examination last for so that 90% of the students can (5 marks) have enough time to complete the examination?
- 5. (*30 marks*) The P&G company manufactures a shirt with two buttons on the front placket and one button on each sleeve cuff. Let *X* denote the number of buttons missing from the front placket and let *Y* denote the number of buttons missing from the sleeve cuffs of a randomly selected shirt. The joint probability mass function for *X* and *Y* is shown below:

		Y	
X	0	1	2
0	0.90	0.03	0.02
1	0.03	0.01	0.01

- (a) Are X and Y independent? Why?
 (5 marks)
 (b) Find E(X), E(Y), Var(X), Var(Y).
 (8 marks)
- (c) Find the correlation coefficient between *X* and *Y*. (4 marks)
- (d) The cost to replace each missing front placket button is \$0.25 and the (8 marks) cost to replace each missing sleeve button is \$0.30. Find the mean and variance of the cost on replacing missing buttons on a shirt.
- (e) A lot of 1000 shirts were manufactured. What is the probability that the (5 marks) overall cost on replacing missing buttons in this lot is more than \$40?

< E N D >