22CS301 – Probability, Statistics and Queueing Theory

Assignment II

1. In an experiment in breeding mice, a geneticist has obtained 120 brown mice with pink eyes, 48 brown mice with brown eyes, 36 white mice with pink eyes and 13 white mice with brown eyes. Theory predicts that these types of mice should be obtained in the ratios 9 : 3 : 3 : 1. Test the compatibility of the data with theory, using a 5% critical value.
2. Four brands of flashlight batteries are to be compared by testing each brand in five flashlights. Twenty flashlights are randomly selected and divided randomly into four groups of five flashlights each. Then each group of flashlights uses a different brand of battery. The lifetimes of the batteries, to the nearest hour, are as follows.

Brand A	Brand B	Brand C	Brand D
42	28	24	20
30	36	36	32
39	31	28	38
28	32	28	28
29	27	33	25

   Preliminary data analyses indicate that the independent samples come from normal populations with equal standard deviations. At the 5% significance level, does there appear to be a difference in mean lifetime among the four brands of batteries?
3. An oil company tested four different blends of gasoline for fuel efficiency according to a Latin square design in order to control for the variability of four different drivers and four different models of cars. Fuel efficiency was measured in miles per gallon (mpg) after driving cars over a standard course.

Driver	Car Model			
	I	II	III	IV

1	D (15.5)	B (33.9)	C (13.2)	A (29.1)
2	B (16.3)	C (26.6)	A (19.4)	D (22.8)
3	C (10.8)	A (31.1)	D (17.1)	B (30.3)
4	A (14.7)	D (34.0)	B (19.7)	C (21.6)

Analyze the data and draw your conclusion.

4. Arrivals at a telephone both are considered to be Poisson at an average time of 8 min between our arrival and the next. The length of the phone call is distributed exponentially, with a mean of 4 min. Determine

a) Expected fraction of the day that the phone will be in use.

b) Expected number of units in the queue and in the system.

c) Expected waiting time in the queue and in the system.

d) Expected number of units in queue that from time to time.

e) What is the probability that an arrival will have to wait in queue for service?

f) What is the probability that exactly 3 units are in system?

g) What is the probability that an arrival will not have to wait in queue for service? h) What is the probability that there are 3 or more units in the system? i) What is the probability that an arrival will have to wait more than 6 min in queue for service?

j) What is the probability that more than 5 units in system?

k) What is the probability that an arrival will have to wait more than 8 min in system? l) Telephone company will install a second booth when convinced that an arrival would have to wait for attest 6 min in queue for phone. By how much the flow of arrival is increased in order to justify a second booth.