MA 60209 Design of Experiments
Assignment No. 1

1. A Consumer-advocacy group wants to compare four different brands of flashlight batteries. Five randomly selected batteries of each brand are tested. The lifetime of the batteries to the nearest hour are as follows:

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

a) Use Bartlett's test and Levene' test to determine whether it is reasonable to assume equality of variances of 5 groups.
b) Estimate the overall mean and treatment effects.
c) At 5% significance level, does there appear to be a difference in the mean lifetimes of the four brand of batteries?
d) Use Scheffe, Tukey, Fisher's LSD and Duncan's multiple range tests.
e) Construct simultaneous confidence intervals.

2. Four groups of students were subjected to the different teaching techniques and tested at the specified period of time. Because of the dropouts in the experimental groups (sickness, transfers etc.), the number of students varied from group to group.
   Use Bartlett's test and Levene' test to determine whether it is reasonable to assume equality of variances of 5 groups.

a) Estimate the overall mean and treatment effects.
b) At 5% significance level, does there appear to be a difference in the mean lifetimes of the four brand of batteries?
c) Use Scheffe, Tukey, Fisher's LSD and Duncan's multiple range tests.
d) Construct simultaneous confidence intervals.

Techniques			
1	2	3	4
65	75	59	94
87	69	78	89
73	83	67	80
79	81	62	88
81	72	83	
69	79	76	
	90		

3. An electronic engineer is interested in the effect on tube conductivity of five different types of coating for cathode ray tubes used in telecommunications system display device. The following conductivity data are obtained.

Coating type	Conductivity			
1	143	141	150	146
2	152	149	137	143
3	134	133	132	127
4	129	127	132	129
5	147	148	144	142

(a) Use Bartlett's test to determine whether it is reasonable to assume equality of variances of 5 groups.
(b) Is there any difference in conductivity due to coating type? Use $\alpha = 0.05$.
(c) Estimate the overall mean and treatment effects.
(d) Test all pairs of mean using Duncan's multiple range test, with $\alpha = 0.05$.