MAI0142
Hand in Problems – 11

1. Assume the MANOVA model $\boldsymbol{X} \sim N_{p,n}(\boldsymbol{BC}, \boldsymbol{\Sigma}, \boldsymbol{I}_n)$, where $\boldsymbol{\Sigma}$ has intraclass covariance structure, i.e., $\boldsymbol{\Sigma} = \sigma^2((1-\rho)\boldsymbol{I}_p + \rho \mathbf{1}_p \mathbf{1}_p')$. Derive the MLEs for the unknown parameters $\boldsymbol{B}$, σ^2 and ρ.

2. The data in the table below were analyzed by Danford et al (1960). The average daily score of four trials on a psychomotor testing device was measured for ten days on 45 subjects suffering from cancerous lesions after radiation treatment. The subject were assigned to four groups receiving on of four dosages of radiation.

	Before	Time (days after irradiation)									
	radiation	1	2	3	4	5	6	7	8	9	10
						Controls					
1	191	223	242	248	266	274	272	279	286	287	286
⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮
6	15	22	24	24	38	41	46	62	62	79	74
						25-50r					
7	53	53	102	104	105	125	122	150	93	127	132
⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮
20	205	234	260	269	274	282	282	290	298	304	308
						75-100r					
21	181	206	199	237	219	237	232	251	247	254	250
⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮
35	156	186	198	201	205	210	217	217	219	223	229
						125-250r					
36	201	202	229	232	224	237	217	268	244	275	246
⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮
45	246	257	269	280	289	291	306	301	295	312	311

   (a) Give a Growth Curve model with linear growth for the ten days and estimate all parameters.

   (b) Plot the estimated growths for the four groups.

   (c) Test the hypothesis about intraclass covariance structure for the data at level 5%.