Statistics for Decision Making - II

Full Marks: 60 Time : 3 hrs

Answer 1 to 4 and any 2 from the rest

1. In a greenhouse experiment on wheat, four fertilizer treatments of the soil and four chemical treatments of the seed were used. The data is given in the following table. Analyze the data. (15)

Fertilizers	Chemical Treatment			
	1	**2**	**3**	**4**
1	21.4	20.9	19.6	17.6
2	12.0	13.6	13.0	13.3
3	13.5	14.0	12.7	12.4
4	12.8	13.2	13.7	12.9

2. A scientist conducted crossing experiments with pea plants of different shape and colour. Results of one such pea crossing experiment are given below. The initial hypothesis is that, the four different types occur in proportions of 9:3:3:1. Does the data justify such assumption? (6)

Crossing result	Round Yellow	Round Green	Edged Yellow	Edged Green
Observations	315	108	101	32

3. Consider the following observations :
24,35,12,50,60,70,68,49,80,25,69,28,28,11,83, 31,37,34,54,75,45,95,75,26,43,57,94,48,63,45.
Can it be considered as random? (6)

4. In a study, the reaction times (in seconds) to a stimulus were measured for two groups. One group drank a strong coffee before the stimulus and the other group drank only the same amount of water. There were 9 study participants in the coffee group and 10 participants in the water group. The following reaction times were recorded:

Coffee Group (c)	3.7	4.9	5.2	6.3	7.4	4.4	5.3	1.7	2.9	
Water Group (w)	4.5	5.1	6.2	7.3	8.7	4.2	3.3	8.9	2.6	4.8

Check whether the location parameters of the two groups can be considered to be equal, using i) a parametric test, ii) a non-parametric test. (7+6)

Answer any TWO from question No. (5) – (7)

5. a) For a GLM, show that, the least square estimate $\hat{\beta}$ minimises the sum of squares of the residuals. (5)
b) State and prove Gauss – Markov Theorem. (5)
6. a) Derive the expression(s) for the confidence limits of $\frac{\sigma_X^2}{\sigma_Y^2}$ under bivariate normal set-up. (5)
b) Define i) Uniformly most powerful critical region, ii) Run (5)
7. Let Xi ~ N(iθ, 1), independently, for i = 1,2,…, n. Then discuss an UMP test for H_0: θ = 0 Vs. H_1: θ>0. (10)