Department Of Mathematics
Indian Institute Of Technology, Delhi
MAL390 - Statistical Methods and Algorithms
Minor II Test -- 21-03-2015

Time: One Hour **Total Marks: 21**

Q1. a) What do you mean by the Critical region for testing of a Statistical Hypothesis? Explain its significance.

b) State and prove the Neyman - Pearson Lemma for forming MPCR to test at significance level α simple hypotheses H_0: $\mu = \mu_0$ vs. H_1: $\mu = \mu_1$.

[2 + 5 = 7]

Q2. a) Obtain the best linear combination T of two estimators T1 = $\frac{X_1 + X_2}{2}$ & T2 = $\frac{X_1 + X_2 + X_3}{3}$ to have a new unbiased estimate T for the population mean μ of a $N(\mu, \sigma^2)$ population.

b) Suppose X and Y are random variables with variances σ^2_X and σ^2_Y, respectively. Let ρ be the correlation coefficient between them. Let $U = X \cos\alpha + Y \sin\alpha$ and $V = Y \cos\alpha - X \sin\alpha$ be such that U and V are uncorrelated. Find the value of α.

[4 + 3 = 7]

Q3. a) Two exit polls, each of size 1000, for two candidates of A-party and B-party have been taken one from slum areas and one from developed areas of a city. The results are given in the following table:

↓Area Votes for →	A-party	B-party	Total
Slums	620	380	1000
Developed	550	450	1000
	1170	830	2000

Test at 5% level of confidence whether the voting pattern for the parties is independent of the area.

b) The Data below gives the gain in weights for cattles fed on two diets A and B. Test whether there is a significant difference in the mean weight gain of the two feeds.

Diet A: 25, 32, 30, 34, 24, 14, 32, 24, 30, 31, 35, 25

Diet B: 25, 30, 35, 18, 30, 32, 28, 38, 36, 30, 32, 27, 33, 28, 30

[3 + 4 = 7]