INDIAN STATISTICAL INSTITUTE, BANGALORE CENTRE
B.MATH - Third Year, 2009-10
Statistics - IV, Midterm Examination, February 22, 2010
Marks are shown in square brackets.   **Total Marks: 50**

1. The following data were gathered in Manchester. Is there a relationship between blood type and propensity to peptic ulcer?

	Control	Peptic Ulcer
Group A	3775	246
Group O	4532	361

[10]

2. Consider an $I \times J$ contingency table where the rows $(1 \leq i \leq I)$ are independent samples. Let m_{ij} be the expected count of the (i, j) cell whose probability is p_{ij}. Prove that
$$\log(m_{ij}) = u + u_{1(i)} + u_{2(j)}, \quad \forall i, j,$$
if and only if
$$p_{1j} = p_{2j} = \cdots = p_{Ij}, \quad j = 1, 2, \ldots, J.$$
[10]

3. Suppose $X \sim \chi_k^2$ and $Y \sim \chi_{k+1}^2$ where $k \geq 1$. Find which of the two is stochastically larger than the other. [10]

4. The following table classifies a random sample of 117 couples according to height of husband and wife.

Husband \ Wife	Tall	Medium
Tall	18	28
Medium	20	51

(a) Provide a measure of association between the two factors.
(b) What features does this measure of association (in general) has in comparison with common measures of association for measurement data. [10]

5. Suppose we have a random sample $X_1, \ldots, X_n$ from a continuous distribution with c.d.f. F and density f, both of which are completely unknown.
(a) Define the histogram estimate of f.
(b) Show that the histogram is a consistent estimator of f if the interval width is chosen to be $1/\sqrt{n}$. [10]