

Indian Statistical Institute, Bangalore

B. Math (III)

Second Semester 2015-2016

Mid-Semester Examination : Statistics (IV)

Date: 25-02-2016

Maximum Score 40

Duration: 3 Hours

1. According to a genetic model, the proportions of individuals having the four blood types should

be related by

Type O	q^2
Type A	$p^2 + 2pq$
Type B	$r^2 + 2qr$
Type AB	$2pr$

; where $p + q + r = 1$. Given the blood types of a random

sample of 1000 individuals, how would you test the adequacy of the model?

[10]

2. Prove that the Kolmogorov Smirnov one sample statistic D_n is completely distribution free for any continuous and completely specified distribution function $F_X(\cdot)$ by appealing to the transformation $u = F_X(x)$ in the definition of $D_n = \sup_x |S_n(x) - F_X(x)|$, $S_n(x)$ being empirical distribution function.

[10]

3. Define correlation coefficient ρ between the values of a random variable and their ranks. Obtain ρ when the random sample is drawn from a uniform distribution.

[10]

4. For order statistics of a random sample of size n from any continuous population F_X , show that the interval $(X_{(r)}, X_{(n-r+1)})$; $2r < n$, is a $100(1 - \alpha)\%$ confidence interval for the median of F_X , where $\alpha = 2n \binom{n-1}{r-1} \int_0^{\frac{1}{2}} x^{n-r} (1-x)^{r-1} dx$.

[10]

5. Give an application of Hodge's graphical method to find p -value in a two-sample testing problem.

[10]