

2016

STATISTICS

[ Honours ]

PAPER – VIIA

Full Marks : 50

Time : 2 hours

*The figures in the right hand margin indicate marks*

*Candidates are required to give their answers in their own words as far as practicable*

*Illustrate the answers wherever necessary*

1. Answer any two questions : 8 × 2

- (a) What do you mean by linear model ?  
Distinguish between the fixed effect model and random effect model.

( Turn Over )

- (b) Suppose you are given a set of linear regression equations. Discuss how you test the null hypothesis that the regression lines are parallel.
- (c) Discuss Fairfield Smith's experiment to determine optimum shape and size of plots and blocks.
- (d) Discuss how you analyse a Latin square design when one observation is missing from the data set.

2. Answer any *four* questions : 5 × 4

- (a) Give two latin squares each of order 4 which are mutually orthogonal.
- (b) Name the basic principles of design. Discuss how these principles are used in RBD.
- (c) Compare the efficiency of a LSD with that of RBD.

- (d) Write a note on "Uniformity trial".
- (e) What do you mean by confounding in a factorial experiment ? Distinguishing between total and partial confounding.
- (f) Give the layout of a  $(2^3, 2^2)$  experiment where all the two factors and three factors interactions are confounded.

3. Answer any *three* questions : 3 × 3

- (a) Discuss Yates' method for obtaining factorial effect totals in the case of a  $2^4$  experiment.
- (b) What are the differences between split plot design and factorial experiments ?
- (c) Give the layout of a strip plot design.
- (d) Assuming random effect model, give the ANOVA table of a two-way classified data with more than one observation per cell.

- (e) Give an example, where an analysis of covariance model is preferred over an analysis of variance model.

*[Internal Assessment—5 Marks]*

**NEW**  
**Part-III 3-Tier**  
**2016**  
**STATISTICS**

**(Honours)**

**PAPER—VII (Group-B)**

**(PRACTICAL)**

*Full Marks : 50*

*Time : 4 Hours*

*The figures in the right-hand margin indicate full marks.*

Answer all questions.

1. Life time (in hours) of an electric bulb follows an exponential distribution with p.d.f.

$$f(x, \lambda) = \frac{1}{\lambda} e^{-\frac{x}{\lambda}}, x > 0.$$

Life times of 20 bulbs are :

60, 50, 80, 90, 40, 65, 75, 100, 110, 45, 30, 45, 110,  
105, 115, 60, 50, 110, 40, 90.

*(Turn Over)*

- (i) Find MLE of  $\lambda$  and its standard error.
- (ii) Does it differ from the method of moment estimate ?
- (iii) Also find the MLE of  $\lambda$  when life times below 50 will be recorded as dead instead of exact life lifetime.

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2. The following table give the values of the cephalic index found in two random samples of skulls, one consisting of 15 and the other 13 individuals :

<i>Sample-I</i>	74.1	77.7	74.4	74.0	73.8	79.8
	75.8	82.8	72.2	75.2	78.2	77.1
	78.4	76.3	76.8			
<i>Sample-II</i>	78.8	74.9	72.2	70.4	69.2	72.2
	76.8	72.4	77.4	78.1	72.8	74.3
	74.7					

If it is known that the distribution of cephalic indices for a homogeneous population is normal, analyse the above data to answer the following questions :

- (i) Is the observed variation in the first sample consistent with the hypothesis that the standard deviation of the population from which the sample was drawn is 0.3 ?

(ii) Is it possible that the record sample was obtained from a population in which the mean cephalic index is 72.0?

(iii) Use a test for the equality of means of the two populations if it is known that the populations from which the samples were obtained have the same but unknown variance. Does your conclusion change if the distribution of cephalic indices is not normal but continuous?

(iv) Obtain 90% confidence interval for the ratio of the variances of the populations from which the two samples were obtained. Hence test the equality of the population variances. 20

3. Let  $x \sim b(5, p)$ .

Construct the UMP test for testing  $H_0: p = \frac{1}{2}$  against

$H_1: p > \frac{1}{2}$  with exact size  $\alpha = 0.05$ .

Find the power of the test at  $p = 0.75$ . 8

4. Practical Note Book and Viva Voce. 5+5