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3(Sem-5) STS M1 Pr

2017

STATISTICS

(Major Practical)

Paper : 5·5

Full Marks – 75

Pass Marks – 30

Time – Four hours

The figures in the margin indicate full marks for the questions.

GROUP – A

Answer *all* the questions.

1. (a) The mean height of 50 male students who showed above average participation in college athletics was 68·2 inches with a standard deviation of 2·5 inches ; while 50 male students who showed no interest in such participation had a mean height of 67·5 inches with a standard deviation of 2·8 inches.

[Turn over

Then

(i) test the hypothesis that male students who participate in college athletics are taller than other male students.

(ii) by how much should the sample size of each of the two groups be increased in order that the observed difference of 0·7 inches in the mean heights be significant at the 5% level of significance ? 7

(b) The average length of time for students to register for summer classes at a certain college has been 50 minutes with a standard deviation of 10 minutes. A new registration procedure using modern computing machines is being tried. If a random sample of 12 students had an average registration time of 42 minutes with standard deviation of 11.9 minutes under the new system, test the hypothesis that the population mean has not changed at 5% level of significance. 6

2. (a) The sample values from population with the p.d.f $f(x) = (1+\theta)x^{\theta}$, $0 < x < 1, \theta > 0$ are as follows : 6

0·46 0·38 0·61 0·82 0·59 0·53 0·72 0·44 0·59 0·60

Find the estimated θ by Maximum likelihood estimation.

(b) A random variate X takes the values 0, 1, 2 with respective probabilities 6

$$\frac{\theta}{4N}+\frac{1}{2}\left(1-\frac{\theta}{N}\right);\ \frac{0}{2N}+\frac{\alpha}{2}\left(1-\frac{\theta}{N}\right) \text{ and}$$

$$\frac{\theta}{4N}+\frac{1-\alpha}{2}\left(1-\frac{\theta}{N}\right),$$ where N is a known number and α, θ are unknown parameters. If 75 independent observations on X yielded the values 0, 1, 2 with frequencies 27, 38 and 10 respectively, estimate θ and α by the method of moments.

3. (a) The following table represents the summary of data for complete census of all the 340 villages in a certain district. The villages are stratified by the size of their agricultural area into four strata and yields the following data : 15

Stratum numbers	Size of villages (in bighas)	Ni	$\overline{Yi}$	Si
1	0 – 300	63	112.1	56.3
2	501–1500	199	276.7	116..4
3	1501–2500	53	558.1	186.0
4 and over	2501 and above	25	960.1	361.3

Calculate the sampling variance of the estimated area under wheat for a sample of 34 villages

(i) if the villages are selected by simple random sampling

(ii) if the villages are selected by stratified random sampling under

(a) the size of the strata (Ni)

(b) the products Ni Si.

(b) In a population of size N = 6, the values Y_i^s of an observable variate are 8, 3, 3, 11, 4 and 7. Calculate the sample mean $\bar{y}$ for all possible simple random samples of size 2. Verify that $\bar{y}$ is an unbiased estimate of $\overline{Y}$ and that its variance is $\frac{S^2}{3}$ where

$$S^2 = \frac{1}{5}\sum(Y_i - \overline{Y})^2$$ 10

GROUP – B

4. Practical notebook. 5

5. Viva voce. 5

6. Internal Assessment. 15