

RAMAKRISHNA MISSION VIDYAMANDIRA

(Residential Autonomous College affiliated to University of Calcutta)

B.A./B.Sc. THIRD SEMESTER EXAMINATION, DECEMBER 2018

SECOND YEAR [BATCH 2017-20]

STATISTICS [General]

Date : 20/12/2018

Time : 11.00 am – 1.00 pm

Paper : III

Full Marks : 50

[Use a separate Answer Book for each Group]

Group – A

Answer any two questions from Question Nos. 1 to 4 :

[2×5]

1. If $x_1, x_2, \dots, x_n$ is a random sample from a normal population $N(\mu, \sigma^2)$, how are the followings distributed? [merely state the results without proof]

(i) $\sum_{i=1}^n \frac{(x_i - \bar{x})^2}{\sigma^2}$ (ii) $\frac{\bar{x} - \mu}{s/\sqrt{n}}$, where $s^2 = \frac{\sum_{i=1}^n (X_i - \bar{x})^2}{n-1}$ [2+3]

2. Suppose a random sample $x_1, x_2, \dots, x_n$ of size n is chosen from $N(\mu, \sigma^2)$. Find out $E(\bar{x})$ and $V(\bar{x})$ when the sampling is SRSWR. [2+3]

3. If the standard error of sample mean for simple random sample with replacement is twice that for simple random sample without replacement, show that $4n = 3N + 1$, where n & N denote the sample size & population size respectively. [5]

4. A random variable X follows binomial distribution with parameters n and p . Find an unbiased estimator of p^2 . [5]

Answer any two questions from Question Nos. 5 to 8 :

[2×10]

5. Suppose $(x_1, x_2, \dots, x_n)$ is a random sample from $N(\mu, \sigma^2)$, where μ & σ are unknown. Find the maximum likelihood estimates of μ & σ . [5+5]

6. a) Suppose that a random sample of size 10, drawn from a normal population, has mean 40 & s.d.12. Find 99 % confidence limits for the population mean [Given $t_{0.005} = 3.25$ for 9 d.f.]
b) Suppose the s.d. of a random sample of size 20 from a normal population is 12. Find 95% confidence interval for the population variance. [Given that for 19 d.f. , $\chi^2_{0.975} = 8.9$ & $\chi^2_{0.025} = 32.85$] [5+5]

7. a) λ is the average number of misprints per page of a book published by a good publication. To test the null hypothesis $\lambda = 0.5$ against the alternative hypothesis $\lambda = 1$, a page of the book is

chosen at random & if that page contains more than one misprint, then the null hypothesis is rejected. Find the probability of type I, type II errors & power of the test. [2+2+2]

- b) Explain what do you understand by the term p-value in the context of testing a hypothesis. [4]
8. a) Explain the application of Pearsonian statistics for testing independence of two attributes. [5]
- b) A random sample of 500 oranges was taken from a large consignment & 65 were found to be bad. Can we conclude that the proportion of bad oranges in the entire consignment is 15%? [Given $\tau_{0.025} = 1.96$] [5]

Group – B

Answer any two questions from Question Nos. 9 to 12 : [2×5]

9. Discuss with example the difference between seasonal and cyclical fluctuation with respect to a time series data. [5]
10. State relative merits and demerits of chain base and fixed base indices. [5]
11. What do you mean by base shifting in calculation of an index number. Hence define splicing. [5]
12. What are the advantages and disadvantages of moving average method to find trend values. [5]

Answer any one question from Question Nos. 13 & 14 : [1×10]

13. Fit a parabolic trend equation to the given data by method of last squares and estimate the production for year 2023. [10]

Year:	2013	2015	2016	2017	2018
Production('000 tones)	550	721	946	1308	1585

14. Calculate the price index number for 1985 with 1978 as base using Fisher's formula on the basis of the following data. [10]

Commodity	Price per unit (in Rs.)		Money value (Rs.)	
	1978	1985	1978	1975
A	4	8	40	38
B	6	9	42	45
C	5	11	60	70
D	3	6	24	24
E	2	4	32	30

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