

BACHELOR OF TECHNOLOGY (C.B.C.S.) (2021-COURSE)
B. Tech. Sem - II CS&BS :SUMMER- 2022
SUBJECT : STATISTICAL METHODS

Day : Thursday
Date : 28-07-2022

S-24137-2022

Time : 10:00 AM-01:00 PM
Max. Marks : 60

N.B.:

- 1) All questions are **COMPULSORY**.
- 2) Figures to the right indicate **FULL** marks.
- 3) Use of non-programmable **CALCULATOR** is allowed.
- 4) Assume suitable data if necessary.

Q.1 Distinguish between simple random sampling with replacement and simple sampling without replacement. [10]

OR

Q.1 What is systematic sampling? Write advantages and disadvantages of systematic sampling. [10]

Q.2 Given the following, determine the regression equation of : [10]

- a) X_1 on X_2 and X_3 b) X_2 on X_1 and X_3
 $r_{12} = 0.8,$ $r_{13} = 0.6,$ $r_{23} = 0.5$
 $\sigma_1 = 10,$ $\sigma_2 = 8,$ $\sigma_3 = 5$

OR

Q.2 To study the performance of three detergents and three different water temperatures, the following 'Whiteness' readings were obtained with specially designed equipment. [10]

Water temperature	Detergent A	Detergent B	Detergent C
Cold water	57	55	67
Warm water	49	52	68
Hot water	54	46	58

Perform a two-way analysis of variance, using 5% level of significance.
(Given $F_{0.05} = 6.94$).

Q.3 If X_1, X_2, \dots, X_n is a random sample form $N(\mu, \sigma^2)$ population. Show that [10]

$T = \frac{1}{n+1} \sum_{i=1}^n X_i$ is biased but consistent for μ . Hence, obtain the unbiased estimator of μ .

OR

Q.3 Find the maximum likelihood estimate of θ , in the Poisson distribution, [10]

$$f(x) = \frac{e^{-\theta} \theta^x}{x!} \quad x = 0, 1, 2, \dots$$

Q.4 What is testing of hypothesis? What is the procedure of testing of hypothesis? [10]

OR

P.T.O.

Q.4 Let P be the probability that a coin will show head in a single toss. In order to test $H_0 : P = \frac{1}{2}$ against $H_1 : P = \frac{3}{4}$, the coin is tossed 5 times and H_0 is rejected if more than 3 heads are obtained. Find the probability of Type – I error and power of the test. [10]

Q.5 Use the sign test to see if there is a difference between the number of days until collection of an account receivable before and after a new collection policy. Use 0.05 significance level. [10]

Before	31	29	35	36	41	43	34	39	35	46	29	28	26	42	37
After	33	30	34	33	38	44	41	42	38	45	28	34	31	39	37

OR

Q.5 In a study done from various streams of a college 60 students, with equal number of students drawn from each stream, the intention of the students to join adventured club of college noted after the interviewed are listed below. [10]

Course	BCS	Law	B. Com.	M. A.	M. Com.
No. of each class	4	10	11	17	18

It was expected that 12 students from each class would join the adventure club. Use Kolmogorov - Smirnov test to find if there is any difference among student classes with regard to their intention of joining the club.

Q.6 Calculate 5-yearly and 7-yearly moving averages for the following data of the number of commercial and industrial failures in a country during 2002 to 2017. Also plot the actual and trend values on a graph. [10]

Year	2002	2003	2004	2005	2006	2007	2008	2009
Value	24	27	29	33	21	13	13	11

Year	2010	2011	2012	2013	2014	2015	2016	2017
Value	10	14	12	15	13	10	4	2

OR

Q.6 What are different component of time series? Describe briefly each of these components. [10]

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