

BACHELOR OF TECHNOLOGY (CBCS) (2021-COURSE)
B. Tech. Sem - II COMPUTER SCIENCE & BUSINESS SYSTEMS : SUMMER : 2024
SUBJECT: STATISTICAL METHODS

Day : Friday
Date : 24/05/2024

S-24137-2024

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 What is simple random sampling? Describe the types of simple random sampling briefly. [10]

OR

Q.1 What is stratified sampling? What are the advantages and disadvantages of stratified sampling? [10]

Q.2 Find the multiple linear regression equation of X_1 on X_2 and X_3 from the data relating to three variables given below: [10]

X_1	4	6	7	9	13	15
X_2	15	12	8	6	4	3
X_3	30	24	20	14	10	4

OR

Q.2 The following table gives the number of refrigerators sold by 4 salesmen in three months May, June, July. [10]

Month	Salesmen			
	A	B	C	D
May	50	40	48	39
June	46	48	50	45
July	39	44	40	39

Is there a significant difference in the sales made by the four salesmen? Is there a significant difference in the sales made during different months? Use ANOVA technique. The table value of $F_{0.05}(3, 6) = 4.76$ and $F_{0.05}(2, 6) = 5.14$.

Q.3 In a simple random sampling with replacement, show that sample variance is the consistent estimator of population variance. [10]

OR

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

$$f(x) = \binom{n}{x} \theta^x (1-\theta)^{n-x}, \quad x = 0, 1, 2, \dots, n.$$

Q.4 What are the steps of testing of hypothesis? Explain. [10]

OR

P.T.O.

- Q.4 A coin is tossed 10 times. Test the null hypothesis $H_0 : P = \frac{1}{2}$ and P is the probability of 'Head'. The hypothesis is rejected if more than 6 'Heads' are obtained. Find the probability of Type - I error. If the alternative hypothesis be $H_1 : P = 0.7$, find the probability of committing Type - II error. Also obtain power of the test. [10]

- 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 adventure club of college noted after the interviewed are listed below. [10]

Course	B. Sc.	B. A.	B. Com.	M. A.	M. Com.
No. of each class	5	9	11	16	19

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.

OR

- Q.5 Twenty four applicants for a position are interviewed by three administrators and rated on a scale of 5 as to suitability for the position. Each applicant is given a "suitability" score which is the sum of the three numbers. Although college education is not a requirement for position, a personnel director felt that it might have some bearing on suitability for the position. Raters made their rating on the basis of individual interviews and were not told the educational background of the applicants. Twelve of the applicants had completed atleast two years of college. Use the Mann Whitney V-test to determine whether there was a difference in the scores of the two groups. Use 0.05 level of significance. Group A had an educational background of less than two years of college, while group B had completed atleast two years of college. [10]

Suitability Score

Group A	7	11	9	4	8	6	12	11	9	10	11	11
Group B	8	9	13	14	11	10	12	14	13	9	10	8

- Q.6 What do you understand by 'analysis of time series'? What are its components? Explain. [10]

OR

- 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	23	26	28	32	20	12	12	10

Year	2010	2011	2012	2013	2014	2015	2016	2017
Value	9	13	11	14	12	9	3	1

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