BACHELOR OF TECHNOLOGY (CBCS - 2023)
B. Tech. Sem-II Computer Science & Business Systems : SUMMER : 2025
SUBJECT: STATISTICAL METHODS & MODELLING

Day : Monday
Date : 26/05/2025

S-27708-2025

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) Draw neat and labeled diagram **WHEREVER** necessary.
5) Assume suitable data if necessary.

Q.1 Distinguish between simple random sampling with replacement and simple random sampling without replacement. Explain with examples. **(10)**

OR

Q.1 The following is the score of 80 students in a test out of 10: **(10)**

Marks	0	1	2	3	4	5	6	7	8	9	10
No. of students	5	8	10	15	12	8	7	6	5	3	1

Choose a sample of size 6 from these marks with replacement. Use the following random numbers:

3590 2667 1980 0423 4512 3582 9105 0679
1973 6539 2751 3547 0950 7621 5963 9830

Q.2 Obtain the equations of two lines of regression for the following data. Also obtain the estimate of X for Y = 70. **(10)**

X	65	66	67	67	68	69	70	72
Y	67	68	65	68	72	72	69	71

OR

Q.2 Set up two-way ANOVA Table and test if there is any difference between the yield of different plots and if there is any difference in the performance of different fertilizers for the following data: **(10)**

Plots → Fertilizers↓	A	B	C	D
Nitrogen	6	4	8	6
Potash	7	6	6	9
Phosphate	8	5	10	9

Given F value for $v_1 = 3, v_2 = 6$ is 4.76 and for $v_1 = 2, v_2 = 6$ is 5.14, both at 5% level of significance

Q.3 Find the unbiased estimate of the mean and the standard deviation of the population and also the estimate of standard error of sample mean from the random sample drawn from an unknown population 34, 46, 42, 38, 40, 48. **(10)**

OR

Q.3 Find the maximum likelihood estimator of α in the exponential distribution $f(x, \alpha) = \alpha e^{-\alpha x}; x \geq 0$. **(10)**

P.T.O.

Q.4 Write the procedure of testing of hypothesis. What is Type I and Type II error? (10)

OR

Q.4 If $x \geq 1$ is the critical region for testing $H_0: \theta = 2$ against the alternative $\theta = 1$, on the basis of the single observation from the population (10)

$$f(x, \theta) = \theta e^{-\theta x}, 0 \leq x < \infty,$$

Obtain the values of type I and type II errors.

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 Consider a survey on two different universities at the postgraduate students on the topic of their willingness to join the research funding project on Artificial Intelligence. The following results obtained: (10)

University 1	3	2	3	5	8	9	8	8
University 2	2	8	2	4	4	3	6	0

Determine whether the samples for university 1 and university 2 come from same distribution? (Use Kolmogorov-Smirnov test)
(Given: $D_{0.05} = 0.714285$)

Q.6 What are the different components of time series? Describe briefly each of these components. (10)

OR

Q. 6 Estimate the trend values using the data given by taking a four-yearly moving average for the years from 1996 to 2009. (10)

Year	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Value	12	25	39	54	70	87	105	100	82	65	49	34	20	7

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