BACHELOR OF TECHNOLOGY (CBCS - 2023)

B. Tech. Sem-II COMPUTER SCIENCE & BUSINESS SYSTEMS : SUMMER : 2024

SUBJECT: STATISTICAL METHODS & MODELLING

Day : Friday
Date : 24/05/2024

S-27708-2024

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

Q.1 Write short note on: **(10)**

a) Simple random Sampling
b) Stratified Sampling

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 student	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 From the data relating to the yield of dry bark (X_1), height (X_2) and girth (X_3) for 18 cinchona plants, the following correlation coefficients were obtained: **(10)**

$$r_{12} = 0.77 , r_{13} = 0.72 , r_{23} = 0.52$$

Find the partial correlation coefficient $r_{12.3}$ and multiple correlation coefficient $R_{1.23}$.

OR

Q.2 The following table gives the number of refrigerators sold by 4 salesmen in three months May, June and July **(10)**

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

i) Is there a significant difference in the sales made by the 4 salesmen?

ii) Is there significant difference in the sales made during different months? (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. Define Type I error and Power of the Test? (10)

OR

Q.4 Let p be the probability that a coin will show head in a single toss. In order to test $H_0: p = 1/2$ against $H_1: p = 3/4$, the coin is tossed 3 times and H_0 is rejected if more than 2 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 On a commuter train, the conductor wants to see whether the passengers entering a train enter in a random manner. He observes the first 25 people with the following sequence of males (M) and females (F) (10)

FFFMMFFFFMFMMMFFFFMMFFFMM

Test for randomness at 5% l.o.s. by Run Test.

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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