BACHELOR OF TECHNOLOGY (CBCS) (2021-COURSE)

B. Tech. Sem - II Computer Science and Business Systems : WINTER : 2023

SUBJECT : STATISTICAL METHODS

Day : Tuesday

Date : 21-11-2023

W-24137-2023

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 sampling? Describe various techniques of sampling. **(10)**

OR

Q.1 Define random sample and show how you would achieve randomness. How do you select a random sample from a finite population? Also point out the advantages of stratified random sample. **(10)**

Q.2 In a trivariate distribution: **(10)**

$\sigma_1 = 3,\ \sigma_2 = \sigma_3 = 5$

$r_{12} = 0.6 \quad r_{23} = r_{31} = 0.8$

Find $r_{23.1}$ and $R_{1.23}$

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

1. Is there a significant difference in the sales made by there four salesmen?
2. Is there significant difference in the sales made during different months?

(Given: $F_{0.05}(3,6)=4.76$ and $F_{0.05}(2,6)=5.14$)

Q.3 If a random sample $x_1, x_2, \ldots, x_n$ of size n be drawn from a normal population $N(\mu, \sigma)$, then show that $T = \frac{1}{n}\sum_{i=1}^{n} x_i^2$ is an unbiased estimator of $\mu^2 + \sigma^2$. **(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)**

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 appear. 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)**

P.T.O.

21123-m-coe-mumbai

OR

Q.4 Given the population density function $f(x,\theta)=\theta e^{-\theta x}, 0 \le x \le \infty, \theta > 0$. The null hypothesis $H_0 : \theta = 2$ against the one sided alternative $H_1 : \theta > 2$ will be tested on the following test procedure: **(10)**

H_0 should be rejected if sample a drawn form the population (x) is greater than or equal to 6. Find the type-I error and the power of the test.

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

Before : 30 28 34 35 40 42 33 38 34 45 28 27 25 41 36

After : 32 29 33 32 37 43 40 41 37 44 27 33 30 38 36

OR

Q.5 What is non – parametric tests? What are advantages and disadvantages of non – parametric tests. **(10)**

Q.6 What do you understand by analysis of time series? Explain its components? **(10)**

OR

Q.6 Assume a four yearly cycle and calculate the trend by method of moving averages form the following data relating to the production of tea in India **(10)**

Year	Production	Year	Production
2008	464	2013	540
2009	515	2014	517
2010	518	2015	571
2011	467	2016	586
2012	502	2017	612

* * *

211123-m-Bombay