TM242463B

Reg. No :.....

Name :.....

MASTER'S DEGREE (C.S.S) EXAMINATION, MARCH 2024

2023 ADMISSIONS REGULAR

SEMESTER II - CORE COURSE

ST2C09TM - Statistical Computing I

Time : 3 Hours **Maximum Weight : 30**

Part A

I. Answer any Five questions. Each question carries 6 weight **(5x6=30)**

1. Fit the appropriate binomial to the following data and calculate the theoretical frequencies. Frequency distribution of 26306 throws of 12 dice are given below. Occurrence of 5 or 6 is success.

Number of success	0	1	2	3	4	5	6	7	8	9	10 and over
Frequency	185	1149	3265	5475	6114	5194	3067	1331	403	105	18

2. A sample of 8 villages, from 40, was selected using PPSWR, the probability being proportional to the number of families. The number of children of school going age in those families are given for the selected villages.

No.of Families	5597	862	2532	8368	7357	1146	1645	3523
No.of children of school going age	482	96	196	768	55	41	400	302

The total number of families in the district is 41, 61,598. Estimate the total number of children of school going age in the district and estimate its S.E.

3. The number of pepper standards for selected villages in each of the strata of malappuram district are as follows.

Strata	Total number of villages	Number of villages selected	Total number of pepper standards in the selectes villages
1	360	6	45,16,121,38,64,71,
2	410	8	21,28,36,41,125,137,64,68
3	215	4	34,35,64,71
4	136	3	33,28,63,43

Estimate the total number of pepper standards along with the standard error in Malappuram district. Also estimate the gain in precision due to stratification.

4. From the normal density with a= 10, σ= 2, draw a random sample of size 10 and find an unbiased estimate for a and σ^2. Also, find UMVUE for a+ σ^2 and a+ 6 σ^2.

5. The life time X of components in an experiment is a random variable with pdf

$$f(x) = \frac{1}{\theta} e^{\frac{-x}{\theta}}; 0 < x < \infty, 0 < \theta < \infty$$

.10 components were put on test and the life times were recorded as follows: 0.092, 0.211, 0.230, 0.456, 0.393, 1.258, 4.520, 2.747, 1.881, 1.607. Find the (i) MVUE of θ (ii) 95% C.I for θ.

6. M.C has states 0,1,2,3 and TPM P= $\begin{bmatrix} \frac{1}{2} & \frac{7}{24} & \frac{1}{6} & \frac{1}{24} \\ \frac{1}{6} & \frac{11}{24} & \frac{1}{6} & \frac{5}{24} \\ \frac{1}{2} & \frac{7}{24} & \frac{1}{6} & \frac{1}{24} \\ \frac{1}{6} & \frac{5}{24} & \frac{1}{6} & \frac{11}{24} \end{bmatrix}$ .Find the stationary distribution and mean recurrence time for various states of this M.C

7. Suppose the customers arrive at a counter in accordance with a poisson process with mean rate of 2 per minute. Find the probability that the interval between 2 successive arrivals is,
   a) more than 3 minutes
   b) between 2 and 3 minutes

8. Given below are the means and variance co-variance matrix for 4 variables X_1, X_2, X_3 and X_4 based on a random sample of size 30 observations from a multivariate normal distribution

$$\Sigma = \begin{bmatrix} 16.81 & 13.12 & 4.51 & 5.74 \\ & 14.24 & 5.92 & 9.08 \\ & & 14.21 & 14.16 \\ & & & 17.91 \end{bmatrix}, \mu = \begin{bmatrix} 4.16 \\ 3.89 \\ 6.52 \\ 5.07 \end{bmatrix}$$

   (a). compute multiple correlation coefficient $R_{1(2.3.4)}$. Test whether the population correlation coefficient is zero.
   (b). calculate the partial correlation coefficient $r_{12.34}$ and test for significance.

9. The following table gives 12 observations on 3 variables
   X_1 : 60, 71, 54, 68, 55, 58, 75, 59, 56, 50, 77, 68
   X_2 : 52, 59, 49, 62, 51, 48, 55, 46, 52, 42, 61, 57
   X_3 : 8, 10, 6, 16, 18, 17, 20, 19, 18, 6, 12, 9
   a) Compute $R_{1.23}$ and $r_{12.3}$
   b) Test whether the population multiple correlation coefficient vanishes.