LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

**M.Sc.** DEGREE EXAMINATION - **STATISTICS**

THIRD SEMESTER – NOVEMBER 2010

# ST 3814 - STATISTICAL COMPUTING - II

Date : 03-11-10 Dept. No. Max. : 100 Marks

Time : 9:00 - 12:00

**Note : SCIENTIFIC CALCULATOR IS ALLOWED FOR THIS PAPER**

**Answer any THREE questions**

1 a). Let {Xn, n=0,1,2,...} be a Markov chain with state space {0,1,2} and one step transition          probabilities (12)

P =

    Find (i) P2 (ii)  (iii) P[X2 = 0] given X0 takes the values 0, 1, 2 with probabilities 0.3,

0.4, 0.3 respectively

b). Let {Xn, n=0,1,2,...} be a Markov chain with state space {0,1,2, 3, . . .} and transient function pxy ,          where p01= 1 and for x = 1, 2, 3,. . . (22) 

1. Find f00(n) , n = 1, 2, 3 ,. . .
2. Find mean recurrence time of state 0.
3. Show that the chain is irreducible. Is it Ergodic?
4. Find for x = 0 ,1, 2 . . . whenever it exists
5. Find the stationary distribution, if it exists.

2 a) Consider two independent samples of sizes n1= 10 , n2 = 12 from two tri-variate normal

populations with equal variance-covariance matrices. The sample mean vectors and the pooled

variance- covariance matrix are

 ,  and 

Test whether the mean vectors of the two populations are equal (16)

b) The distances between pairs of five objects are given below:

1 2 3 4 5

Apply the *Single Linkage* Algorithm to carry out clustering of the five objects. (18)

3. Let **X ~ B ( 1, θ ); θ = 0.1, 0.2, 0.3.** Examine if UMP level **0.05** test exists for **H : θ = 0.2** Vs

**K : θ = 0.1, 0.3.** Otherwise find UMPU **0.05** test. (34)

4. In a population with N = 4, the Yi values are 11,12,1 3,1 4,15. Enlist all possible samples of size n = 2, with SRSWOR and verify that E (s2) = S2. Also Calculate the standard error of the sample mean.

(34)

5 (a) Marks secured by over one lakh students in a competitive examination were displayed in 39         display boards. In each board marks of approximately 3000 students were given. Kiran, a student         who scored 94.86 marks wanted to know how many candidates have scored more than him. In         order to estimate the number of student who have scored more than him, he took a SRS of 10         boards and counted the number of students in each board who have scored more than him. The        following is the data collected.

13, 28, 5, 12, 0, 34, 14, 41, 25 and 6.

       Estimate the number of student who would have scored more than Kiran and also estimate the        variance of its estimate. (13)

(b) A sample of 30 students is to be drawn from a population consisting of 230 students belonging to       two colleges A and B. The means and standard deviations of their marks are given below:

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Total no. of students(Ni)** | **Mean** | **Standard deviation(σi)** |
| **College X** | 150 | 25 | 7 |
| **College Y** | 80 | 50 | 32 |

How would you draw the sample using proportional allocation technique? Hence obtain the variance of estimate of the population mean and compare its efficiency with simple random sampling without replacement. (21)

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