Unit III

5. (a) A farmer buys 4 cows, 3 goats and 2 hens from a man who has 6 cows, 5 goats, and 7 hens, how many choices does the farmer has ?

(b) If :

$$X = (X_1, \ldots\ldots, X_p)$$

then

$$\Sigma_i \text{ var } (X_i) = \Sigma_{i=1}^{p} \sigma_{ii} = \Sigma_{i=1}^{p} \lambda_1 = \Sigma_{i=1}^{p} \text{ var } (y_i)$$

6. (a) In how many ways a committee of 6 persons is formed from 7 men and 5 women so as to include 3 women at least ?

(b) Show that :

$$q_1 (q_2 + \ldots + q_k) + q_2 (q_3 + \ldots\ldots + q_k) + \ldots\ldots + q_{k-1} q_k = \frac{1}{2}(q^2 - \Sigma_{k=1}^{k} q_k^2)$$

18AA1001

M. Tech. EXAMINATION, May 2019

(First Semester)

(C Scheme) (Re-appear)

CSE

MTCSE501C

Mathematical Foundations of Computer Science

Time : 3 *Hours*] [*Maximum Marks :* 75

Before answering the question-paper candidates should ensure that they have been supplied to correct and complete question-paper. No complaint, in this regard, will be entertained after the examination.

Note : Attempt *Five* questions in all, selecting at least *one* question from each Unit. All questions carry equal marks.

Unit I

1. (a) What is the expectation of the number of failures preceding the first success in an infinite series of independent trials with constant probability p of success in each trial ?

(b) Define :

(i) Probability mass function

(ii) Probability density function of a random gvariable X

2. (a) Let $\{x_n, n \geq 0\}$ be a three state 0, 1, 2 Markov chain with transition probability matrix.

$$\begin{bmatrix} 0.75 & 0.25 & 0 \\ 0.25 & 0.50 & 0.25 \\ 0 & 0.75 & 0.25 \end{bmatrix}$$

with the initial distribution

$p_i = P[X_0 = i] = 1/3, i = 0, 1, 2.$

Find :

$P[X_3 = 1, X_2 = 2, X_1 = 1, X_0 = 2].$

(b) Compute Var (X) when X represents the outcome when we roll a fair dice. Hence compute the variance of the sum obtained when six independents rolls of a fair dice are made ?

Unit II

3. (a) What are the advantages and disadvantages of methods of moments.

(b) Suppose that $y_1, y_2, ..., y_n$ is a random sample from a N $\left(\theta, \sigma^2\right)$ population where both θ and σ^2 are parameters. Determine the method of moment estimators θ_{MOM} and $\sigma^2{}_{MOM}$.

4. (a) Let $X_1, X_2, X_3, ...X_n$ be iid N (μ, σ^2) random variables. Let $x_1, x_2, ..., x_n$ be the sample values. Find the likelihood function.

(b) Let $X_1, X_2, X_3, ...X_n$ be random sample from U $(0, \theta)$ $\theta > 0$. Find the maximum likelihood estimator of θ.

Unit IV

7. (a) Defne an Eulerian Circuit ? State and prove Euler's Theorem.

(b) Differentiate between Homomorphic and Isomorphic Graphs.

8. (a) Find, weather the following graph have an Euler circuit, an Euler path but no circuit. Give reasons also.

(b) Prove that the vertices of every planner graph can be properly coloured with five coloured.

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