THE TAMIL NADU DR. M.G.R. MEDICAL UNIVERSITY

[AHS 1023] **OCTOBER 2023** **Sub. Code: 2861**

M.Sc. BIOSTATISTICS
FIRST YEAR (From 2011-2012 onwards)
PAPER I – PROBABILITY AND DISTRIBUTION THEORY

Q.P. Code: 282861

Time: Three hours **Answer ALL Questions** **Maximum: 100 Marks**

I. Elaborate notes on: **(2 x 20 = 40)**

1. a) State and Prove Chebyshev's inequality.

   b) Suppose that we extract an individual at random from a population whose members have an average income of Rs.40000 with a standard deviation of Rs 20,000. What is the probability of extracting an individual whose income is either less than Rs.10000 or greater than Rs.70000?

2. a) Derive the marginal and conditional distribution of X and Y in a bivariate normal distribution.

   b) Define expectation. State and prove all properties of expectation.

II. Write Short Notes on: **(10x6 = 60)**

1. Mean and variance of Hypergeometric distribution.
2. If X and Y are independent random variables show that g(x) and h(y) function of X and Y is also independent. Is the converse true?
3. Convergence in probability.
4. Inversion formula.
5. If X ~ Binomial (n,p) then find an upper bound on $P(X \geq \alpha n) p < \alpha < 1$. Evaluate the bound for $p=1/2$ and $\alpha=3/4$using Markov's inequality.
6. Discuss the difference between moment generating function and characteristic function.
7. State and prove Cochran's theorem.
8. Write a Cauchy criterion for almost sure convergence.
9. Mahalanobis D^2 statistic.
10. Find the moment generating function of Normal distribution.

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