

PAPER NO-5: PROBABILITY AND STATISTICAL METHODS-III

1. Bivariate and Multivariate Distributions
 - 1.1 Discrete and Continuous type, c.d.f., p.d.f
 - 1.2 Marginal and conditional distributions, independence
 - 1.3 Expectation and Conditional Expectation of Bivariate distributions
 - 1.4 Inversion Theorem (without proof) and related problems
 - 1.5 Multinomial Distribution.
2. Bivariate Normal Distribution (BVN)
 - 2.1 p.d.f. of BVN
 - 2.2 Properties of BVN
 - 2.3 Marginal and conditional p.d.f. of BVN
 - 2.4 Marginal and conditional p.d.f. of Multivariate Normal Distribution (MVN)
3. Correlation and regression
 - 3.1 Karl Pearson's Coefficient of Correlation and its properties
 - 3.2 Lines of Regression
 - 3.3 Spearman's Rank Correlation Coefficient
 - 3.4 Intra-class Correlation coefficient
 - 3.6 Correlation Ratio
 - 3.7 Multiple and Partial correlation coefficients (for three variates only)
4. Limit Laws
 - 4.1 Convergence in probability, almost sure convergence, convergence in mean square and convergence in distribution and their inter relations
 - 4.2 Chebyshev's inequality
 - 4.3 WLLN, SLLN and their applications
 - 4.4 De-Moivre Laplace theorem.
 - 4.5 Central Limit Theorem (C.L.T.) for i.i.d. variates
 - 4.6 Applications of C.L.T. and Lyapunov Theorem (without proof)

WEEK-WISE DETAILS

Week 1-3: Bivariate and Multivariate Distributions

- Goon, A.M., Gupta, M.K. and Dasgupta. B. (2003): *An Outline of Statistical Theory, Vol. I*, 4th Edition. World Press, Kolkata, pp. 224-243
- Panik, M.J. (2005): *Advanced Statistics from elementary point of View*, Elsevier Academic Press. pp. 147-187

Week 4-6: Bivariate Normal Distribution (BVN)

- Panik, M.J. (2005): *Advanced Statistics from elementary point of View*, Elsevier Academic Press. pp. 281-285
- Kapoor, K.N. (2010): *A Textbook of Probability Theory*, International Book House, Delhi. pp.314-328
- Anderson, T.W. (2003): *Introduction to Multivariate Statistical Analysis*, 3rd Edition, John Wiley and Sons. Sec. 2.3(Theorems without proof), 17-27.

Week 7-10: Correlation and Regression

- Gun, A.M., Gupta, M.K. and Dasgupta. B. (1998): *Fundamentals of Statistics, Vol. I*, 7th Edition World Press, Kolkata, pp. 245-275,277-297
- Goon, A.M., Gupta, M.K. and Dasgupta. B. (2003): *An Outline of Statistical Theory, Vol. I*, 4th

Edition World Press, Kolkata, pp. 243-248

Week 11-12: Limit Laws

- Parzen, E. (1992): *Modern Probability Theory and its Applications*, Wiley-Inter Science (Paper back Wiley Classic). pp.226-227, 414-417
- Goon, A.M., Gupta, M.K. and Dasgupta. B. (2003): *An Outline of Statistical Theory, Vol. I*, 4th Edition, World Press, Kolkata. pp. 435-441, 443-448

Practical/ Lab work

LIST OF PRACTICALS

1. Karl Pearson correlation coefficient (without change of scale and origin).
2. Karl Pearson correlation coefficient (with change of scale and origin).
3. Karl Pearson correlation coefficient after correcting wrong values.
4. Correlation coefficient for a bivariate frequency distribution (without change of scale and origin).
5. Correlation coefficient for a bivariate frequency distribution (with change of scale and origin).
6. Lines of regression, angle between lines and estimated values of variables.
7. Lines of regression and regression coefficients.
8. Spearman rank correlation without ties.
9. Spearman rank correlation with ties.
10. Partial and Multiple correlations for given simple correlations.
11. Partial and Multiple correlations for raw data.
12. Planes of regression and variances of residuals for given simple correlations.
13. Planes of regression and variances of residuals for raw data.
14. Intra-class correlation ratio.