RAMAKRISHNA MISSION VIDYAMANDIRA

(Residential Autonomous College under University of Calcutta)

B.A./B.Sc. SECOND SEMESTER EXAMINATION, MAY 2014

FIRST YEAR

Date : 28/05/2014 **Statistic (General)**

Time : 11 am – 1 pm Paper : II Full Marks : 50

(Use a separate Answer Book for each group)

Group – A

1. Answer **any two** questions of the following :- (2 × 5)

a) Prove that $-1 \le \rho_{xy} \le 1$. Interpret the terminal cases.

b) Define correlation coefficient ρ_{xy} and correlation ratio η_{xy}. When is the latter a more suitable measure of correlation than the former?

c) Explain the following measures of association :

i) odds ratio ii) γ-measure (Gamma)

d) If $u = \frac{x-a}{b}$ and $v = \frac{y-c}{d}$, where a, b, c, d > 0, what will be the relationship between r_{xy} & r_{uv}? Explain.

2. Answer **any one** question of the following :- (1 × 15)

a) i) Prove that $1 \ge \eta_{yx}^2 \ge \rho_{yx}^2 \ge 0$. (9)

ii) Derive the least square regression line of y on x and find the angle between two regression lines. (6)

b) i) Define spearman's rank correlation coefficient. What happens if there is

I) Complete agreement II) Complete disagreement with respect to the ranks? (5 + 6)

ii) Show that spearman's rank correlation coefficient is the simple product moment correlation coefficient of ranks. What changes are required to make the formula compatible to the case of ties? (4)

Group – B

3. Answer **any two** questions of the following :- (2 × 5)

a) A filling station is supplied with gasoline once a week. If its weekly volume of sales in thousands of gallon is a random variable with probability density function

$$f(x) = \begin{cases} 5(1-x)^4 & ; 0 < x < 1 \\ 0 & ; \text{otherwise} \end{cases}$$

What need the capacity of the tank be so that the probability of the supply's being exhausted in a given week is 0.01? (5)

b) The density function of X is given by

$$f(x) = \begin{cases} a + bx^2 & ; 0 \le x \le 1 \\ 0 & ; \text{otherwise} \end{cases}$$

If E(x) = $\frac{3}{5}$; find a & b. (5)

c) State and prove the product theorem of expectation for discrete case only. (5)

d) i) State the central limit theorem. (2)

ii) Suppose it is known that the number of items produced in a factory during a week is a random variable with mean 50. If the variance of a week's production is known to equal 25, then what can be said about the probability that this week's production will be between 40 & 60? (3)

4. Answer **any one** question of the following :- (1 × 15)

a) i) State the demoivre-laplace limit theorem. (2)

ii) If Z_α is defined by $\int_{Z_\alpha}^{\infty} N(Z;0,1)dz = \alpha$ (Where $N(Z;0,1) = \frac{1}{\sqrt{2\pi}} e^{-z^2/2}$), find its value for $\alpha = 0.05$. (3)

iii) State and prove chebychev's inequality. (10)

b) i) Find the moment generating function about origin of $N(\mu, \sigma^2)$. (2)

ii) If $x \sim N(\mu_1, \sigma_1{}^2)$ & independent of $x, y \sim (\mu_2, \sigma_2{}^2)$. Find the distribution of X + Y, using the m.g.f approach. (3)

iii) The pattern of sunny (state 1) & rainy (state 2) days on the planet rainbow is a homogeneous markov chain with two states. Every sunny day is followed by another sunny day with probability 0.8. Every rainy day is followed by another rainy day with probability 0.6. Today is sunny on Rainbow. What is the chance of rain the day after tomorrow? (10)