

This question paper contains 7 printed pages]

11/5/2010

Saturday
Evening

Roll No.

--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

S. No. of Question Paper : 2999

39

Unique Paper Code : 32375201

IC

Name of the Paper : Introductory Probability

Name of the Course : Statistics : GE for Honours

Semester : II

Duration : 3 Hours

Maximum Marks : 75

(Write your Roll No. on the top immediately on receipt of this question paper.)

Section I is compulsory.

Attempt any five questions,

selecting at least two questions from each of the

Sections II and III. Use of simple calculator is allowed.

Section I

- (a) If $P(A) = 0.3$, $P(B) = 0.2$ and $P(A \cap B) = 0.1$, then obtain $P(\bar{A} \cap \bar{B})$.
- (b) State Kolmogorov's three axioms of probability.

P.T.O.

- (c) If X and Y are independent events and $E(X) = 10$, $E(Y) = 20$, then find $E(XY)$.
- (d) Can, for some random variable X , $P(\mu_X - 2\sigma_X \leq X \leq \mu_X + 2\sigma_X) = 0.9545$?
- (e) If $M_X(t) = (0.9 + (0.1)e^t)^{100}$, then obtain $E(X^2)$.
- (f) If $E(X) = 1$, $E(X^2) = 4$ and $M_X(t) = e^{\alpha + \beta t + \gamma t^2}$, then obtain the values of α , β and γ .
- (g) X and Y are independent normal variates with means 1, 2 and variances 25 and 36 respectively. Compute $E(e^{\alpha X + \beta Y})$.
- (h) If $E(X) = \mu$ and $\text{Var}(X) = \sigma^2$ and using Chebychev's inequality we get $E(|X - \mu| \leq k\sigma) > 1 - a$, then obtain the value of a .
- (i) If $\sigma_X^2 = 25$, $\sigma_Y^2 = 36$ and $\text{Cov}(X, Y) = 10$, then obtain $\text{Var}(2X - 3Y)$.
- (j) State Demoivre Laplace central limit theorem.

(1,1,1,1,1,2,2,2,2,2)

- (b) Show that $\Gamma\left(\frac{1}{2}\right) = \sqrt{2} \int_0^{\infty} e^{-\frac{1}{2}z^2} dz$ and hence evaluate $\Gamma\left(\frac{1}{2}\right)$. 6,6
8. (a) The random variables $X_i (i = 1, 2, 3, 4)$ are independently and identically distributed with probability density function $f(x) = \frac{1}{\sqrt{32\pi}} \exp\left[-\frac{1}{2}\left(\frac{x-7}{4}\right)^2\right]$. Obtain the probability density function of $U = \frac{1}{4} \sum_{i=1}^4 X_i$ and $V = X_1 - 2X_2 + 3X_3 - 4X_4$.
- (b) The amount of cosmic radiations to which a person is exposed when flying by JET across the US is a random variable having normal distribution with a mean of 4.35 units and a standard deviation of 0.59 units. What is the probability that a person will be exposed to more than 5.53 units of cosmic radiations on such a flight ? 6,6 [Use $e^{-8} = 0.00035$, $e^{-4} = 0.01832$ and for standard normal distribution $P(-1 < Z < 1) = 0.6628$, $P(-2 < Z < 2) = 0.9544$ and $P(-3 < Z < 3) = 0.9973$]