C 83026 (Pages : 2) Name..............................70....

Reg. No..................................

SECOND SEMESTER B.Sc. DEGREE EXAMINATION, MAY 2015

(CUCBCSS—UG)

Complementary Course—Statistics

ST 2C 02—PROBABILITY DISTRIBUTIONS

Time : Three Hours Maximum : 80 Marks

Section A

*[One word questions. Answer **all** questions. Each question carries 1 mark]*

Fill up the blanks :

1. If X is a random variable with finite mean, then E (2X + K) = 2K + ———.
2. The variables which are not stochastically independent are said to be ———.
3. If X and Y are independent, then the correlation between X and Y is ———.
4. Binomial distribution $b(n, p)$ is symmetric when $p =$ ———.
5. Fourth central moment of standard normal distribution is ———.

Write True *or* False :

6. Moment generating function does not exist always.
7. A curve is mesokurtic when $\beta_2 = 0$.
8. E (X + Y) = E (X) + E (Y).
9. Negative binomial distribution possesses all the properties of geometric distribution.
10. Normal curve is asymmetric.

(10 × 1 = 10 marks)

Section B

*[One sentence questions. Answer **all** questions. Each question carries 2 marks].*

11. Define central moments.
12. Define characteristic function.
13. Define skewness.
14. Define independence of random variables.
15. Define Karl Pearson correlation coefficient.
16. Define Cauchy distribution.
17. State Chebyshev's inequality.

(7 × 2 = 14 marks)

Turn over

Section C

[Paragraph questions. Answer any **three** *questions. Each question carries 4 marks].*

18. State and establish multiplication theorem of expectation.
19. Distinguish between joint and marginal probability mass functions.
20. Establish a relation between raw moments and central moments.
21. Define discrete uniform distribution. Derive its moment generating function.
22. Define convergence in probability. Discuss its importance.

(3 × 4 = 12 mark

Section D

[Short Essay questions. Answer any **four** *questions. Each question carries 6 marks].*

23. Prove or disprove : Covariance is independent of change of origin but not independent of chang of scale.
24. Prove that Var (X) = E [Var (X/Y)]+Var [E (X/Y)].
25. Let $f(x, y) = C\, xy\, e^{-(x^2+y^2)}, x \geq 0, y \geq 0$ be the joint probability density function of (X, Y). Th (i) determine C ; and (ii) examine the independence of X and Y.
26. Derive the mean deviation about mean of binomial distribution.
27. Establish the lack of memory property of exponential distribution.
28. State and establish the weak law of large numbers for independent and identically distribut random variables.

(4 × 6 = 24 marl

Section E

[Essay questions. Answer any **three** *questions. Each question carries 10 marks].*

29. (a) Define variance of a random variable X. Show that it is independent of shifting of the orig
    (b) If X and Y are independent random variables, show that Var (X + Y) = Var (X – Y).
30. (a) Define conditional mean and conditional variance.
    (b) If the joint probability mass function of X and Y is :

$$f(x, y) = \frac{x+3y}{24}, (x, y) = (1, 1), (1, 2), (2, 1), (2, 2),$$

    find E (X | Y = 2) and Var (X | Y = 2).
31. (a) Distinguish between beta type I and type II distributions.
    (b) In case of normal distribution, show that mean, median and mode coincides.
32. (a) State Bernoulli's law of large numbers.
    (b) State and prove Lindberg-Levy CLT.

(2 × 10 = 20 ma