K18U 1919

Reg. No. : ....

Name : ....

III Semester B.Sc. Degree (CBCSS-Reg./Sup./Imp.) Examination, November 2018
(2014 Admn. Onwards)
COMPLEMENTARY COURSE IN STATISTICS FOR MATHEMATICS/ COMPUTER SCIENCE CORE
3C03STA : Standard Probability Distributions

Time : 3 Hours

Max. Marks : 40

PART – A

Answer **all** questions. **Each** question carries **1** mark.

1. If E(X) = 10, compute E(3X + 5).
2. If X and Y are two independent random variables, with m.g.f. $M_x(t)$ and $M_y(t)$ respectively, obtain the m.g.f. of X + Y.
3. Give the relationship between central moments and moments about the origin.
4. Define geometric distribution.
5. Give the characteristic function of a normal distribution.
6. Define the beta distribution of the first kind.

(6×1=6)

PART – B

Answer **any six** questions. **Each** question carries **2** marks.

7. Show by an example that the mathematical expectation of a random variable need not exist always.
8. State and prove the multiplication theorem on mathematical expectation.
9. A coin is tossed until a head appears. What is the expectation of the number of tosses ?
10. Obtain the mean and variance of discrete uniform distribution.
11. State and prove the additive property of the Poisson distribution.
12. If X follows normal distribution with mean μ and S.D.σ; obtain the m.g.f. of $\frac{X-\mu}{\sigma}$.

P.T.O.

13. The mean and variance of a binomial distribution are 4 and $\frac{4}{3}$ respectively. Find the probability of getting more than 2 successes.

14. State Lindberg-Levy form of central limit theorem; clearly giving the assumptions. **(6×2=12)**

PART – C

Answer **any four** questions. **Each** question carries **3** marks.

15. Define cumulant generating function and obtain the first three cumulants in terms of the central moments.

16. If X and Y are two independent random variables, show that $V(aX \pm bY) = a^2V(X) + b^2V(Y)$; where a and b are constants.

17. If X has a uniform distribution in [0, 1], show that $Y = -2 \log_e X$ has an exponential distribution.

18. X is normally distributed with mean 12 and S.D. 4. Find (i) $P(0 \leq X \leq 12)$ (ii) Find x' such that $P(x > x') = 0.24$.

19. Obtain the mean and variance of the gamma distribution with parameters α and β.

20. If X is the number scored in a throw of a fair die, show that the chebychev's inequality gives $P(|X - \mu| > 2.5) < 0.47$ where μ is the mean of X ; while the actual probability is zero. **(4×3=12)**

PART – D

Answer **any two** questions. **Each** question carries **5** marks.

21. Suppose that two dimensional continuous random variable (X, Y) has joint probability density function

$$f(x, y) = \begin{cases} ex^2y, & 0 < x < 1, \quad 0 < y < 1 \\ 0, & \text{otherwise} \end{cases}$$

i) Find C

ii) Verify whether X and Y are independent.

22. Show that under certain conditions (to be stated), the binomial distribution tends to the Poisson distribution.

23. Derive the general expression for the central moments of the normal distribution.

24. State and prove weak law of large numbers. **(5×2=10)**
