19102127

QP CODE: 19102127

Reg No : ....

Name : ....

B.Sc. DEGREE (CBCS) EXAMINATION, OCTOBER 2019

Third Semester

COMPLEMENTARY COURSE - ST3CMT03 - STATISTICS - PROBABILITY DISTRIBUTIONS

(Common to B.Sc Computer Applications Model III Triple Main, B.Sc Mathematics Model I, B.Sc Physics Model I)

2017 Admission Onwards

97DE51CB

Maximum Marks: 80 Time: 3 Hours

Part A

*Answer any **ten** questions.*

*Each question carries **2** marks.*

1. Define r^{th} raw moment and r^{th} central moment in terms of expectation.
2. Find the characteristic function of $f(x) = a\, e^{-ax}$; $x > 0, a > 0$.
3. Mention two examples of random variables following discrete uniform distribution.
4. Obtain the mgf of Bernoulli distribution.
5. Obtain the mgf of binomial distribution.
6. If X and Y are independent Poisson random variables with parameters m_1 and m_2 respectively, show that $Z = X – Y$ does not follow Poisson distribution.
7. Define one parameter gamma distribution.
8. Find the mean of two parameter gamma distribution.
9. Obtain the second raw moment of type - 1 beta distribution.
10. State Lindberg- Levy form of central limit theorem.
11. Mention any two uses of standard error.
12. Define student's t distribution.

(10×2=20)

Part B

*Answer any **six** questions.*

*Each question carries **5** marks.*

13. State and prove Cauchy - Schwartz inequality.
14. Let the joint pdf be $f(x, y) = 2(x + y - 3xy^2)$; $0 < x < 1$, $0 < y < 1$. Find E(X) and E(Y).
15. For uniform distribution over (0, b), find coefficient of variation.
16. Find the mean and variance of hyper geometric distribution.
17. Establish the lack of memory property of exponential distribution.
18. X is a normal random variable with mean 20 and SD 5. Find the probability that (1) $16 < X < 22$ (2) $X > 23$ (3) $|X - 20| > 5$.
19. Show that the weak law of large numbers is true for the mean of a random sample of size n from a population with finite mean and variance.
20. Derive the mgf of chi - square distribution and hence find mean and variance.
21. If X is a random variable following F distribution with (n_1, n_2) degrees of freedom, show that Y = 1/X follows F distribution with (n_2, n_1) degrees of freedom.

(6×5=30)

Part C

*Answer any **two** questions.*

*Each question carries **15** marks.*

22. The joint pdf is given by $f(x, y) = 2 - x - y$; $0 < x < 1$, $0 < y < 1$ and 0 elsewhere. Find (1) V(X) (2) V(Y) (3) COV(X, Y).
23. (a) Establish the lack of memory property of geometric distribution.

    (b) Let X and Y be two independent random variables such that $P(X = r) = P(Y = r) = q^r p$; r = 0, 1, 2, … where p + q =1. Find the conditional distribution of X given X + Y.
24. (a) Obtain the mean, variance and harmonic mean of type – 1 beta distribution.

    (b) Show that type – 2 beta distribution can be obtained from type – 1 beta distribution using transformation of variables.
25. (1) State and prove Tchebycheff's inequality.

    (2) Two unbiased dice are thrown and X denotes the sum of the numbers shown. Find an upper bound to the probability that X will not be between 4 and 10 using Tchebycheff's inequality.

(2×15=30)