2904N180

Candidate's Seat No :________

BSc Sem.-4 Examination
CC 204
Statistics
April 2022

Time : 2-00 Hours] **[Max. Marks : 50**

All the question in section I carry equal marks.
Attempt **any three** questions from section I.
Section II is compulsory.

Section-I

1. (A) Define Geometric distribution. Obtain MGF of geometric distribution. Hence determine mean and variance.
   (B) State and prove the memoryless property for geometric distribution.
2. (A) Define negative binomial distribution. Derive the CGF of negative binomial distribution. Hence determine find first four cumulants.
   (B) Prove that Poisson distribution is a limiting case of Negative Binomial distribution.
3. (A) Define Cauchy distribution. Derive the distribution function and hence determine the median of Cauchy distribution.
   (B) Define Laplace distribution. Derive the distribution function of Laplace distribution.
4. (A) Define Log-normal distribution. Derive quartiles of log-normal distribution.
   (B) Define two parameter Weibull distribution. Derive the distribution function and hence determine median of Weibull distribution.
5. (A) Define a normal distribution. Derive the moment generating function of normal distribution. Hence determine its mean and variance.
   (B) Let $X \sim N(\mu, \sigma^2)$. Show that all the odd order central moments of X are zero. Also find the expression for even order central moments.
6. (A) Let $(X, Y) \sim BVND(\mu_1, \mu_2, \sigma_1^2, \sigma_2^2, \rho)$. Obtain the conditional distribution of Y given $Y = x$.
   (B) Let $(X, Y) \sim BVND(\mu_1, \mu_2, \sigma_1^2, \sigma_2^2, \rho)$. Show that X and Y are independent if and only if $\rho = 0$.
7. (A) State and prove Bernoulli's Law of Large numbers.
   (B) State and prove the Weak Law of Large Numbers.
8. (A) Define characteristics function. Derive the characteristics function of geometric distribution.
   (B) State and prove the Lindberg-Levy form of central limit theorem.

Section-II

 Please go on to the next page...

P.T.O

N-180-2

B.Sc. Semester IV (Statistics STA-204)
Semester Examination

9. Select correct answer:

   (i) If $X \sim NB(r, p)$, the mean and variance of X are

   A. rp and rpq B. rq/p and rq/p^2 C. rp/q and rp/q^2 D. none of these.

   (ii) Let X_1 and X_2 be two independent and identically distributed random variables with geometric distribution $Geo(p)$, the conditional distribution of X_1 givenn $X_1 + X_2$ is

   A. geometric B. negative binomial C. uniform D. binomial.

   (iii) The mean and variance does not exists for

   A. Laplace distribution B. Cauchy distribution C. Weibull distribution D. Hypergeometric distribution.

   (iv) The graph of Cauchy distribution is

   A. Symmetric B. Positively skewed C. Negatively skewed D. Cannot say surely.

   (v) Let $X \sim N(0, 1)$ and $Y \sim N(0, 1)$ be independent random variables. The distribution of X/Y is

   A. Standard Laplace B. Standard Cauchy C. Weibull D. Exponential.

   (vi) Let X and Y be two independent and identically distributed exponential variates with parameter θ. The distribution of $X - Y$ is

   A. Cauchy B. Weibull C. Exponential D. Laplace.

   (vii) If $Y \sim N(\mu, \sigma^2)$ distribution, then the distribution of $X = e^Y$ is

   A. Normal B. Cauchy C. Log-normal D. Laplace.

   (viii) The characteristic function of $B(n, p)$ is

   A. $(q + pe^{it})^n$ B. $(q - pe^{it})^n$ C. $(q + pe^{-it})^n$ D. $(p + qe^{it})^n$.

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End of Paper.