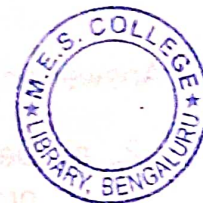


Second Semester B.Sc. Examination, May/June 2018
(CBCS) (Fresh) (2017-18 and Onwards)

STATISTICS – II
Basic Statistics – 2



Time : 3 Hours

Max. Marks : 70

Instructions : 1) Answer **ten** sub-divisions from Section A and **five** questions from Section B.

2) Scientific calculators are **permitted**.

SECTION – A (20 marks)

1. Answer any ten sub-divisions from the following : (10×2=20)

- Define a random variable (r.v.) and distinguish between discrete r.v. and continuous r.v.
- Define probability mass function (pmf) of a r.v. and state its properties.
- If X is a r.v, a and b are constants, prove that $E(aX + b) = aE(X) + b$.
- State the properties of moment generating function (m.g.f.) of a r.v.
- Define binomial distribution. Mention the conditions for its convergence to Poisson distribution.
- Comment on the following statements :
 - The mean and variance of Binomial distribution are 3 and 4 respectively.
 - For Poisson distribution $E(X) = 8$ and $V(X) = 6$.
- Find mean of exponential distribution with p.d.f. : $f(x) = \theta e^{-\theta x}$; $x > 0$ and $\theta > 0$.
- If (X, Y) has joint p.d.f. : $f(x, y) = e^{-(x+y)}$; $x > 0$ and $y > 0$ find marginal p.d.f. of X .
- If X and Y are two independent random variables, show that their covariance is zero.
- Define conditional expectation.
- Find "K" if $f(x, y) = K(x + y)$; $0 < x < 1$ and $0 < y < 2$ is the joint p.d.f. of (X, Y) .
- State central limit theorem for independent and identically distributed random variables.



SECTION – B (50 marks)

Answer any five questions from the following :

(5×10=50)

2. a) Define distribution function of a random variable. State its properties and prove one of them.
- b) Prove the following :
- i) $E(aX) = aE(X)$
 - ii) $V(aX) = a^2 V(X)$
 - iii) $E(X - a) = E(X) - a$, where 'X' is a r.v. and 'a' is a constant.
- c) A r.v. X takes the values -2, -1, 0 and 1 with probabilities $\frac{1}{8}, \frac{1}{8}, \frac{1}{4}$ and $\frac{1}{2}$ respectively. Find the probability distribution of $Y = X^2 + 1$ and also cumulative distribution. (4+3+3)
3. a) Find mean and variance of Binomial distribution.
- b) Obtain the recurrence relation for central moments of Poisson distribution and hence obtain variance. (5+5)
4. a) Find mean of Hyper-Geometric distribution.
- b) Obtain m.g.f. of geometric distribution.
- c) State and prove additivity property of negative-binomial variates. (3+3+4)
5. a) Define continuous uniform distribution and obtain its mean and variance.
- b) Find the distribution function of exponential distribution with mean $\frac{1}{\theta}$.
- c) Define Cauchy distribution. (5+3+2)
6. a) Define Gamma distribution and establish its additivity property.
- b) Find mean and variance of Beta distribution of second kind. (4+6)
7. a) Obtain m.g.f. of normal distribution.
- b) For Normal distribution, show the all odd ordered central moments are zero and derive the expression for even ordered central moments. (4+6)



8. a) State and prove multiplication theorem of expectation for two random variables and generalize it.
- b) The joint p.d.f. of (X, Y) is $f(x, y) = k(x + y)$; $0 < x < 1$ and $0 < y < 2$. Find
- i) k
 - ii) $E(X)$
 - iii) $V(X)$.
- (4+6)
9. a) State and prove Chebyshev's inequality.
- b) Prove that Gamma distribution $G(\alpha)$ converges to normal distribution. (5+5)
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