

2/EH-28 (ii) (Syllabus-2015)

2018

(April)

STATISTICS

(Elective/Honours)

(Probability Distributions and
Statistical Inference)

[STEH-2(TH)]

Marks : 56

Time : 3 hours

*The figures in the margin indicate full marks
for the questions*

Answer **five** questions, taking **one** from each Unit

UNIT—I

1. (a) Define a binomial variate. Obtain its distribution with parameters p and n . 2+4
- (b) Obtain the m.g.f. of the binomial distribution and hence or otherwise obtain the mean and variance of the distribution. 6
2. (a) Define a geometric distribution. 2
- (b) Let X be a discrete random variable having geometric distribution with parameter p . Obtain its mean and variance. 4

(2)

- (c) State and prove the reproductive property of the Poisson distribution. Show that the mean and variance of this distribution are equal. 6

UNIT—II

3. (a) Define normal distribution. Mention the main characteristics of this distribution and draw the normal curve. 4
- (b) Show that any linear combination of n independent normal variates is also a normal variate. 4
- (c) Show that the exponential distribution 'lacks memory' if X has an exponential distribution, then for every constant $a \geq 0$, one has
- $$P(Y \leq x | X \geq a) = P(X \leq x)$$
- for all x , where $Y = X - a$ 3

4. (a) Let X and Y be independent standard normal variates. Obtain the m.g.f. of XY . 5
- (b) Write short notes on the following : 6
- (i) Q-Q plot
- (ii) P-P plot

UNIT—III

5. (a) Explain clearly the term 'standard error'. 2

8D/1712

(Continued)

(3)

- (b) The variance of the sample mean is σ^2/n , where σ is the population standard deviation and n is the size of the random sample. Prove that the SE of mean of a random sample of size n from a population with variance σ^2 is σ/\sqrt{n} . 2

- (c) What are the conditions for the validity of χ^2 -test? 3

- (d) Show that the sum of independent chi-square variates is also a χ^2 -variate. 4

6. (a) State and prove Chebyshev's inequality. 2+4 5
- (b) Define the following :
- (i) Student's t statistic
- (ii) F -distribution

UNIT—IV

7. (a) What do you mean by 'point estimator'? Define the following terms with example : 1+6
- (i) Consistency
- (ii) Efficiency
- (iii) Unbiasedness
- (iv) Sufficiency

- (b) If X be a normal variate with parameters μ and σ^2 , find the MLE for (i) μ when σ^2 is known and (ii) σ^2 when μ is known. 4

8D/1712

(Turn Over)

8. (a) Define minimum variance unbiased estimator. If T_1 is an MVUE of $\gamma(\theta)$ and T_2 is any other unbiased estimator of $\gamma(\theta)$ with efficiency $e < 1$, then prove that no unbiased linear combination of T_1 and T_2 can be an MVUE of $\gamma(\theta)$. 2+5
- (b) What do you mean by confidence interval and confidence limits? 4

UNIT—V

9. (a) Illustrate the following terms with example : 6
- (i) Null and alternative hypothesis
 - (ii) Errors of type I and type II
 - (iii) Critical region
 - (iv) Level of significance
- (b) Explain the test of significance for difference of proportions. 5
10. (a) Explain clearly the assumptions involved in the 't-test' for testing the significance of the difference between the two sample means. 5
- (b) Write a note on 't-test' for testing the significance of an observed correlation and regression coefficient. 6
