

**Odd Semester, 2020**

( Held in March, 2021 )

**STATISTICS**

( Elective/Honours )

[ STEH-1 (TH) ]

**( Descriptive Statistics, Numerical Analysis and Probability )***Marks : 56**Time : 3 hours**The figures in the margin indicate full marks for the questions*Answer **five** questions, selecting **one** from each Unit**UNIT—I**

1. (a) What do you mean by qualitative data and quantitative data? Give examples. 3
- (b) Explain with the help of an example, the concepts of statistical population and a sample. 3
- (c) Explain the need and usefulness of graphical and diagrammatic representation of data. Explain briefly with rough sketches, the construction of a histogram for grouped data. 3+3=6

2. (a) What do you understand by mode? Discuss its relative merits and demerits as a measure of central tendency. Also give two practical situations where you will recommend the use of mode. 1+3+2=6
- (b) Define the raw and central moments of a frequency distribution. Express the raw moments of order  $r$  in terms of central moments. 2+4=6

**UNIT—II**

3. (a) Define correlation. Discuss its significance. 1+2=3
- (b) Does high degree of correlation between the two variables signify the existence of cause and effect relationship between the two variables? Explain. 4
- (c) Show that the correlation coefficient  $r$  is independent of the change of origin and scale. 4
4. (a) What are regression lines? Distinguish between regression and correlation. 2+3=5
- (b) Show that the correlation coefficient between the observed and the estimated values of  $Y$  obtained from the line of regression of  $Y$  on  $X$  is the same as that between  $X$  and  $Y$ . 6

## UNIT—III

5. (a) Prove the following :  $2+2=4$   
 (i)  $E \equiv (1 - \nabla)^{-1}$   
 (ii)  $\nabla E \equiv E \nabla$   
 (b) What is meant by interpolation?  
 Establish Newton's forward interpolation formula.  $2+5=7$
6. (a) State and prove Lagrange's interpolation formula. 6  
 (b) What is numerical integration? Write down the conditions for the validity of Simpson's one-third rule for numerical integration.  $2+3=5$

## UNIT—IV

7. (a) Explain the following terms with examples :  $2+2+2=6$   
 (i) Random experiment  
 (ii) Trial and event  
 (iii) Simple event and compound event  
 (b) Give the classical definition of probability. Show that the occurrence of an event lies between 0 and 1. What do you mean by certain event and impossible event?  $1+2+2=5$

8. (a) Let  $A$  and  $B$  be two events defined on the sample space  $S$ . Prove that  
 $P(A \cap B) \leq P(A) \leq P(A \cup B) \leq P(A) + P(B)$  5  
 (b) Define conditional probability. 2  
 (c) The chance that doctor  $A$  will diagnose a disease  $X$  correctly is 60%. The chance that a patient will die by his treatment after correct diagnosis is 40% and the chance of death by wrong diagnosis is 70%. A patient of doctor  $A$ , who had disease  $X$ , died. What is the chance that his disease was diagnosed correctly? 4

## UNIT—V

9. (a) Define a random variable and its expectation. A random variable  $X$  has the following probability distribution :  
 $x$  : 0 1 2 3 4 5  
 $p(x)$  : 0.1 0.2 0.3 0.1 — 0.1  
 Find  $p(4)$  and consequently  $E(X)$ .  $2+2+2=6$   
 (b) Define distribution function. The distribution function of a continuous random variable is defined by  
 $F(a) = 0.5$ ,  $F(b) = 0.7$ ,  $F(c) = 0.5$   
 Evaluate the following :  $1+1=2$   
 (i)  $P(a \leq X \leq b)$   
 (ii)  $P(b \leq X \leq c)$

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(c) Write down the properties of the distribution function. 3

10. (a) Define moment generating function. Let  $X$  be a random variable with p.d.f.

$$f(x) = \begin{cases} \lambda e^{-\lambda x} & ; 0 < x < \infty, \lambda > 0 \\ 0 & ; \text{otherwise} \end{cases}$$

Find the m.g.f., mean and variance of  $X$ . 1+4=5

(b) Define the following terms : 2+2+2=6

(i) Joint probability mass function

(ii) Marginal probability mass function

(iii) Conditional probability mass function

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