2018

(October)

STATISTICS

(Elective/Honours)

(Descriptive Statistics, Numerical Analysis and Probability)

[STH-1 (TH)]

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)* Write briefly a note on statistical population and sample. Give examples of each. **3**

(b) Define classification. State the different methods of classification of statistical data. **3**

(Turn Over)

(c) Discuss briefly the purpose served by tabulation. State the requirements of a good statistical table. 3

(d) Write briefly a note on graphic representation of statistical data. 3

2. (a) Define Arithmetic Mean (AM), Geometric Mean (GM) and Harmonic Mean (HM). Show that

$$AM \geq GM \geq HM$$ 3+3=6

(b) Write a note on skewness and kurtosis. Draw diagram where necessary. Write the relation between mean, median and mode for moderately skewed distribution. 6

UNIT—II

3. (a) Define Karl Pearson's coefficient of correlation. What does it measure? 3+1=4

(b) Write the properties and assumptions of Karl Pearson's coefficient of correlation. 5

(c) If x and y are two independent variables, show that they are uncorrelated. 1

(d) If the correlation coefficient between two related variables x and y be 0·5, what will be the correlation coefficient between y and x? 1

4. (a) What is regression? What do you mean by 'lines of regression'? 3

(b) Write the regression equations of Y on X and X on Y. Also write the properties of regression coefficient. 4

(c) How do you interpret regression coefficient of Y on X? 1

(d) Show that

(i) the geometric mean of the regression coefficients is the correlation coefficient. 1½

(ii) if one of the regression coefficients is >1, then the other must be <1. 1½

UNIT—III

5. (a) Define Δ and E operators. Write their properties. 1+3=4

(b) Prove that

$$e^x = \left(\frac{\Delta^2}{E}\right)e^x \times \frac{Ee^x}{\Delta^2 e^x}$$ 3

(c) State and prove Newton's forward interpolation formula. 4

6. What do you mean by numerical integration? Obtain the general quadrature formula and hence obtain trapezoidal rule of numerical integration. 2+5+4=11

UNIT—IV

7. (a) Define probability. What are the assumptions required for the 'classical definition of probability'? 3

(b) Show that

(i) if A and B be two mutually exclusive events, then

$$P(A \cup B) = P(A) + P(B)$$ 2

(ii) if A and B be any two events (not necessarily mutually exclusive), then

$$P(A \cup B) = P(A) + P(B) - P(A \cap B)$$ 2

(c) A pair of unbiased dice is thrown. If the two numbers appearing be different, then find the probabilities that (i) the sum is six and (ii) the sum is 5 or less. 4

8. (a) Define conditional probability and independence of events. 4

(b) If

$$P(A) = \frac{2}{5},\ P(B) = \frac{1}{3} \text{ and } P(A \cup B) = \frac{1}{2}$$

find $P(A / B)$ and $P(B / A)$. 4

(c) State Baye's theorem. Give an example of it and write its applications. 3

UNIT—V

9. (a) Define discrete and continuous random variables. Give examples and write their properties. 6

(b) (i) Define probability density function. 2

(ii) The diameter of an electric cable, say X, is assumed to be a continuous random variable with pdf

$$f(x) = 6x(1-x),\ 0 \le x \le 1$$

Verify that $f(x)$ is pdf. 3

10. *(a)* Define mathematical expectation of a random variable. Write its properties. 3

(b) If X and Y are random variables, then show that

$$E(X+Y)=E(X)+E(Y)$$ 3

(c) Define the following : 1×5=5

(i) Moment generating function

(ii) Cumulant generating function

(iii) Probability generating function

(iv) Conditional expectation

(v) Conditional variance

★★★