1/EH–28 (i) (Syllabus–2015)

2019

(October)

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 statistical data? Write a note on the types of statistical data. What are the different methods of collecting primary data and secondary data? 1+2+3=6

(b) Explain the following terms with rough sketches : 2×3=6

(i) Histogram

(ii) Frequency polygon

(iii) Ogive

2. (a) Give the concept of measure of dispersion. Mention the different measures of dispersion with advantages and disadvantages. What are the different requisites for an ideal measure of central tendency? 1+4+2=

(b) Define moments. Express first four central moments in terms of moments about the origin. 1+4=

UNIT—II

3. (a) How can you use scatter diagram to obtain an idea of the correlation coefficient? 3

(b) Explain multiple and partial correlation coefficients with examples. 2+2=4

(c) Prove that correlation coefficient always lies between –1 and +1. 4

4. (a) What is linear regression? Why are there in general two lines of regression? 1+2=3

(b) Obtain the angle between the two lines of regression. 3

(c) Write a note on intraclass correlation coefficient. 5

(Continued

UNIT—III

5. (a) Define the operators Δ and E. Obtain the relationship between Δ and E. Show that

$$\Delta \log f(x) = \log\left[1 + \frac{\Delta f(x)}{f(x)}\right]$$

1+1+3=5

(b) State and prove Newton's divided difference formula. 1+5=6

6. (a) What do you mean by numerical integration? Deduce the general quadrature formula and hence obtain Simpson's $\frac{1}{3}$rd rule of numerical integration. 2+5+2=9

(b) Define the following terms : 1+1=2

(i) Arguments

(ii) Entry

UNIT—IV

7. (a) State and prove addition theorem of probability. 1+3=4

(b) If A and B are two independent events, then show that—

(i) A and $\bar{B}$ are also independent events;

(ii) $\bar{A}$ and $\bar{B}$ are also independent events. 2+2=4

(Turn Over)

(c) If A and B be two mutually exclusive events, then prove that

$$P(A \cup B) = P(A) + P(B)$$ 3

8. (a) Let a pair of fair dice be thrown. If the two numbers appearing be different, then find the probabilities that (i) the sum is 6 and (ii) the sum is 5 or less. 4

(b) If $P(A) = \alpha$, $P(B) = \beta$, then show that

$$P(A \mid B) = \frac{(\alpha + \beta - 1)}{\beta}$$ 2

(c) State and prove Bayes' theorem. 5

UNIT—V

9. (a) Define discrete and continuous random variables. 1+1=2

(b) Define the terms (i) probability mass function (p.m.f.) and (ii) probability density function (p.d.f). 1+1=2

(c) The diameter of an electric cable, say, X, is assumed to be a continuous random variable with p.d.f.

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

Verify that $f(x)$ is p.d.f. 3

(Continued)

(d) If $\mu_X(t)$ is the m.g.f. of a random variable X about the origin, then show that the rth moment μ'_r is given by

$$\mu'_r = \left[\frac{d^r \mu_X(t)}{dt^r}\right]_{t=0}$$ 4

10. (a) Prove that

$$V(X) = E[V(X \mid Y)] + V[E(X \mid Y)]$$

where X and Y are any two random variables. 4

(b) Show that

$$E(X) = F[E(X \mid Y)]$$ 2

(c) The joint p.d.f. of two random variables X and Y is given by

$$f(x,y) = \frac{9(1+x+y)}{2(1+x)^4(1+y)^4}; \quad \begin{array}{l} 0 \le x < \infty \\ 0 \le y < \infty \end{array}$$

Find the marginal distribution of X and Y, and the conditional distribution of Y for $X = x$. 5

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