

U.G. 2nd Semester Examination - 2021

STATISTICS

[HONOURS]

Generic Elective (GE)

Course Code : STAT-H-GE-T-02

(Introductory Probability)

Full Marks : 25(20+5)

Time : 1 Hour

The figures in the right-hand margin indicate marks.

Candidates are required to give their answers in their own words as far as practicable.

1. Answer any **five** questions: 1×5=5
 - a) Define 'elementary event' with an example.
 - b) The number of spots on a piece of cloth is observed. Write down the sample space.
 - c) 'If the expectation of a random variable is zero, then each value of the variable is zero' — True or False?
 - d) State the weak law of large numbers.
 - e) Write down the p.m.f. of a discrete distribution having the 'loss of memory property'.
 - f) Define conditional probability.
 - g) Give the axiomatic definition of probability.

[Turn Over]

- h) If X is distributed uniformly over $[-10, 4]$, what is the probability of observing an X that is greater than -1?

2. Answer any **one** question: 5×1=5
 - a) State and prove the theorem of total probability. Show that for any events A and B defined on a sample space

$$P(A) + P(B) - 1 \leq P(A \cap B) \leq \min[P(A), P(B)].$$
 - b) Write down the p.d.f. of an exponential distribution with mean μ . Derive its variance.
 - c) Verify whether weak law of large numbers holds for the following sequence of independent random variables $\{X_n, n=1, 2, \dots\}$:

$$P\left\{X_n = \frac{1}{\sqrt{n}}\right\} = \frac{2}{3}, P\left\{X_n = -\frac{1}{\sqrt{n}}\right\} = \frac{1}{3}.$$

3. Answer any **one** question: 10×1=10
 - a) State and prove Bayes' Theorem and mention one of its applications.
 - b)
 - i) Show that all odd ordered central moments of a normal distribution are zero.
 - ii) Find the variance of a Poisson distribution using its m.g.f.

[Internal Assessment: 5]