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B.A./B.Sc. DEGREE EXAMINATION NOVEMBER 2017.

First Semester

**STATISTICS (OPTIONAL)**

**Paper STTH1 – BASIC STATISTICS, PROBABILITY AND MATHEMATICAL EXPECTATION**

(New Syllabus with effect from 2013-14)

Time : Three hours

Maximum : 80 marks

Mathematical and Statistical tables will be supplied on request.

Use of Simple/Scientific Calculator is permitted.

**PART A — (10 × 2 = 20 marks)**

Answer any **TEN** questions.

Each question carries **2** marks.

(a) Mention any two limitations of Statistics.

(b) Distinguish between nominal and ordinal scales of measurement.

(c) Define mode. Give any one demerit of it.

(d) Mention the uses of geometric mean.

(e) Distinguish between absolute and relative measures of dispersion.

(f) Define skewness and mention different types of skewness.

(g) Define random experiment. Give an example of it.

(h) Give axiomatic definition of probability.

(i) Mention any two properties of distribution function.

(j) Define variance of random variable $X$.

(k) Define :

(i) $r^{th}$ moment about origin $(\mu'_r)$

(ii) $r^{th}$ moment about mean $(\mu_r)$.

(l) Define weak law of large numbers.

**PART B — (6 × 5 = 30 marks)**

Answer any **SIX** questions.

Each question carries **5** marks.

2. (a) Explain briefly the functions of Statistics.

(b) Define Arithmetic mean. Show that sum of the squares of deviations of a set of values is minimum when taken about mean.

(c) What is meant by kurtosis of a curve? Explain the various types of kurtosis of a curve with neat sketches.

(d) Give the classical definition of probability and state its limitations.

(e) State and prove Baye's theorem.

(f) State and prove multiplication theorem of mathematical expectation for two independent random variables $X$ and $Y$.

(g) A random variable $X$ has the probability distribution $P(x) = \frac{kx}{3}$, $x = 1, 2, 3$.

Find $k$ and hence obtain mean and variance.

(h) Define moment generating function and cumulants generating function. How do you obtain $r^{th}$ moment about origin $(\mu'_r)$ from mgf and $r^{th}$ cumulants $(K_r)$ from cgf?

**PART C — (3 × 10 = 30 marks)**

Answer the following questions.

Each question carries **10** marks.

3. (a) Define (i) Geometric mean (ii) Harmonic mean. Discuss the relative merits and demerits of them.

Or

(b) Find mean and variance of first $n$ natural numbers.

4. (a) State and prove addition theorem of probability for any two event Generalize the result for any three events.

Or

(b) For any two events $A$ and $B$ prove that

$P(A \cap B) \leq P(A) \leq P(A \cup B) \leq P(A) + P(B)$.

(a) The joint pdf of $X$ and $Y$ is given by

$$f(x, y) = \begin{cases} \frac{6}{5}(x + y^2), & 0 < x < 1,\ 0 < y < 1 \\ 0 & \text{otherwise.} \end{cases}$$

Find the probabilities $P(0.2 < X < 0.5)$ and $P(0.4 < Y < 0.6)$.

Or

(b) State and prove the various properties of moment generating function.