FIRST SEMESTER B.A./B.Sc. DEGREE EXAMINATION, NOVEMBER 2019

Statistics (Optional)

BASIC STATISTICS, PROBABILITY AND MATHEMATICAL EXPECTATION

Time : Three Hours

Maximum : 80 Marks

1   *Mathematical and Statistical tables will be supplied on request.*

2   *Use of simple/scientific calculator is permitted.*

Part A

Answer any ten questions.
Each question carries 2 marks.

1. (a)   Distinguish between a variable and an attribute.

   (b)   Mention the different levels of measurement scales.

   (c)   Define Median and give any one merit of it.

   (d)   Give the empirical formula for computation of mode.

   (e)   What is dispersion ?

   (f)   What is skewness ? Mention various relative measures of skewness.

   (g)   Define Mutually exclusive events. Give an example.

   (h)   Define conditional probability of an event.

   (i)   Define probability mass function.

   (j)   Define Mathematical Expectation of a random variable X.

   (k)   With usual notations, prove that $M_{CX}(t) = M_X(ct)$.

   (l)   Define cumulant generating function.

   (10 × 2 = 20 marks)

Part B

Answer any six questions.
Each question carries 5 marks.

2. Distinguish between :

   (a)   Discrete and continuous variable.

   (b)   Quantitative data and Qualitative data.

   (c)   Frequency polygon and frequency curve.

Turn over

3. What are the requisites of an ideal measure of central tendency ?

4. Define kurtosis. Show that for any discrete distribution $B_2 \geq 1$.

5. Define moments. Express first four central moments in terms of moments about the origin.

6. If $B \subset A$, then prove the following :

   (i) $P(A \cap \bar{B}) = P(A) - P(B)$.

   (ii) $P(B) \leq P(A)$.

7. State and Prove Baye' theorem.

8. A random variable X has the probability distribution $P(x) = \dfrac{Kx}{3}, x = 1, 2, 3$.

   Find K and hence obtain mean and variance.

9. State and prove Chebyschev's inequality.

$$(6 \times 5 = 30 \text{ marks})$$

Part C

Answer the following questions.
Each question carries 10 marks.

10. (a) Given that $\bar{X}_1$ and $\bar{X}_2$ are the arithmetic means, G_1 and G_2 are the geometric means of two series of sizes n_1 and n_2 respectively then show that the combined mean $\bar{X}$ and combined geometric mean G are :

   (i) $\bar{X} = \dfrac{n_1 \bar{X}_1 + n_2 \bar{X}_2}{n_1 + n_2}$.

   (ii) $G = \text{Antilog}\left[\dfrac{n_1 \log G_1 + n_2 \log G_2}{n_1 + n_2} \right]$.

Or

(b) Find the mean deviation about mean and standard deviation for the following data $a, a + d, a + 2d, \ldots, a + 2nd$ where 'a' is the first term, 'd' is the common difference of a set of $(2n + 1)$ observations.

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11. (a) (1) Define the following terms :

     (i) Random experiment.

     (ii) Outcome.

     (iii) Sample space.

     (iv) Favourable outcomes.

     (v) Independent events :

  (2) If A and B are independent events then show that :

     (i) A and $\overline{B}$.

     (ii) $\overline{A}$ and B.

     (iii) $\overline{A}$ and $\overline{B}$.

  are also independent.

Or

(b) State and Prove addition theorem on probability for any n events.

12. (a) State and Prove multiplication theorem of Mathematical Expectation for any two independent random variables. https://www.karnatakastudy.com

Prove the following :

     (i) $E(a) = a$.

     (ii) $E(aX) = a\,E(X)$.

     (iii) $v(a) = 0$.

     (iv) $v(aX) = a^2 v(X)$.

Or

(b) (1) Define the distribution function of a random variable and state its properties.

  (2) Obtain distribution function, mean and variance for the following probability density function :

$$f(x) = \begin{cases} 3(1-x)^2, & 0 < x < 1 \\ 0 & \text{otherwise} \end{cases}.$$

(3 × 10 = 30 marks)

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