UG/1st Sem/STAT(H)/T/19

2019

B.Sc.

1st Semester Examination

STATISTICS (Honours)

Paper - C 2-T

(Probability and Probability Distributors - 1)

Full Marks : 40 Time : 2 Hours

The figures in the margin indicate full marks. Candidates are required to give their answers in their own words as far as practicable.

1. Answer any *five* questions : 5×2=10

(i) In a bridge party what is the probability that two given players N and S together get K aces ? 2

(ii) You are told that of the four cards drawn form a well shut led pack of cards, two are red and two are black. If you guess all four at randon what is the probability that you get all four right ? 2

(iii) Two dice are thrown r times. Find the probability that each of the sin combinations appears at least. 2

(iv) Give the classical definition of probability. 2

(v) For two events A and B, suppose $P(A|B) > P(A)$, then show that $P(B|A) > (B)$. 2

(vi) Find the distribution of random variable x with MGF

$$M_x(t) = \frac{1}{216}\left(5+e^t\right)^3, t \in \mathbb{R}$$ 2

(vii) Two dice are thrown. Find the espected value of sum of faces. 2

(viii) Give the properties of c.d.f of a random variable. 2

2. Answer any *four* questions. 4×4=20

(i) Let the events $A_1, A_2, \ldots A_n$ be independent and $p(A_x) = px$. Find the probability p that more of the events Occurs. Shows that

$$p < \exp\left(-\sum p_x\right).$$ 5

(ii) r distinguishble balls are placed in a n cells. What is the probability that a given cell will contain k balls. Find the limit of the probability as $n \to \infty$, $r \to \infty$ and $\frac{r}{n} \to \lambda$, $\lambda > 0$. 5

(iii) let n tickets are drawn from N tickets numbered 1, 2...N. Let S denotes the sum of numbers of the tickets drawn. Find $E(S)$ and variance of S. 5

(iv) State and prove Bayes' Theorem on probability. 5

(v) Prove that the set of all discontimuty points of a distribution function is countable. 5

(vi) Show that in a Poisson distribution with unit mean, mean deviation about mean is $\left(\frac{2}{e}\right)$ times the standard deviation. 5

3. Answer any *one* question. 1×10=10

(i) Derive the probability mass function of hypergeometric distribution from suitable tandom experiment.

[Turn Over]

If X is Hypergeometric (N, n, p), then Find $E(X)$ var (x). Also show that

$$\binom{n}{x}\left(p-\frac{x}{N}\right)^{x}\left(1-p-\frac{n-x}{N}\right)^{n-x} < P(X=x)$$

$$< \binom{n}{x} p^{x}(1-p)^{n-x}\left(1-\frac{n}{N}\right)^{-n}$$

2+4+4=10

(ii) (a) The events $E_1, E_2, \ldots E_n$ mutually exclusive in sample space Ω connected to some random experiment let $E=\bigcup_{i=1}^{n} E_i$ show that if $P(A \mid E_i)=P(B \mid E_i)$, $i=1, \ldots n$, then $P(A \mid E)=P(B \mid E)$. Is the result true if $E_1 \ldots E_n$ are mutually exclusive ? 2

(b) Let G & T be texo events in Ω. Show that $P(G \mid T)=P(T \mid G)$ holds if and only if $P(G)=P(T)$. 2

(c) Let A & B be two evnets in Ω, $P(A) = P_1$, $P(B) = P_2$, $P_1 + P_2 > 1$, show that $P(B \mid A) \geq 1 - \frac{1 - p_2}{p_1}$ 2

(d) Define conditional probablity and show that if satisfies all the axioms of axiomatic definition of probability. 2
