Unit-I

FkeâeF-I

2. What do you mean by probability? Discuss all important approaches and definitions of probability stating their merits and demerits.

ØeeeÙekeâlee me Deehe keÙee mecePele n? meYee cenlJeheCe lejekeâe SJe heejYee<eeDee keâe ieCe SJe oe<e yeleele nS eJemlele JeCeve keâeepeS~

3. State and prove Bayes theorem. Suppose 5 men out of 100 and 25 women out of 10,000 are colour blind. A colour blind person is chosen at random. What is the probability of his being male? (Assume male and female to be in equal numbers).

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100 ce me 5 he®<e leLee 10,000 ce me 25 eŒeÙee n~ Skeâ JeCeevOe JÙeeòeâ ÙeeÂeÛÚkeâ ¤he me ÛeÙeevele ekeâÙee peelee n~ Fmekeâ he®<e neve keâe keÙee ØeeeÙekeâlee n? (ceeve ueeepeS ekeâ eŒeÙee Deej he®<ee keâe meKÙee meceeve n)~

A (Printed Pages 8)

S-700

B.Sc. (Part-I) Examination, 2015

STATISTICS

First Paper

(Probability)

Time Allowed : Three Hours] ***[Maximum Marks : 50***

Note : Answer five questions in all. Question No. 1 is compulsory. Attempt one question from each unit.

keâue heeÛe ØeMvee keâe Gòej oeepeS~ ØeMve me. 1 DeeveJeeÙe n~ ØelÙekeâ FkeâeF me Skeâ ØeMve keâeepeS~

1. Attempt all parts :

meYee Yeeie nue keâeepeS :

(i) Define mutually exclusive, exhaustive and independent events.

hejmhej DeheJepee, mJele$e SJe SipeeemšJe lešveeD keâe heejYeee<ele keâeepeS~

(ii) Show that, if $A \subset B$ then $P(A) \leq P(B)$.

eoKeeFÙe Ùeeo $A \subset B$ lee $P(A) \leq P(B)$.

(iii) Let x have p.m.f. as follows : Find its mean.

Ùeeo x keâe Øee. ye. Heâ. evecveeueeKele n lee Fmekeâe ceeOÙe evekeâeeueÙe~

f(x) = 1/3, x = –1, 0, 1

(iv) Let x have mean μ and variance σ^2. Find the variance of $y = \frac{x-\mu}{\sigma}$.

Ùeeo x keâe ceeOÙe μ Deej ØemejCe σ^2 n~ lee $y = \frac{x-\mu}{\sigma}$ keâe ØemejCe evekeâeeueS~

(v) If A and B are independent events then show that $\overline{A}$ and $\overline{B}$ are also independent events.

Ùeeo A Deej B mJele$e leŠveeS n lee eoKeeFS $\overline{A}$ Deej $\overline{B}$ Yee mJele$e leŠveeS neiee~

(vi) Let joint p.d.f. of x and y is given as follows : find marginal pdf of y.

Ùeeo x Deej y keâe meÙeòeâ yeŠve evecveeueeKele n lee y keâe meeceevle Øee. le. Heâ. evekeâeeueS~

$$f(x,y) = \begin{cases} 2 \;; & 0 < x < 1 \;, \quad 0 < y < x \\ 0 & \text{elsewhere} \;, \quad \text{DevÙeLee} \end{cases}$$

(vii) In the long run 3 ships out of every 100

are sunk. If 10 ships are out what is the probability that all will arive safely?

Ùeeo Skeâ uecye Deleejeue ce 100 ce me 3 penepe [ye peele n~ Ùeeo 10 penepe yeenj ieÙe n lee keÙee meYeeJevee n ekeâ meYee mejeef#ele henÛeie?

(viii) If p is the probability of obtaining a head (success) in tossing of a coin, obtain probability of obtaining 'x' failures (tail) before getting first success (head).

Ùeeo emekekeâe GÚeueve ce meHeâuelee (n[) keâe ØeeeÙekeâlee p n lee henuee meHeâuelee (n[) keâ henue x DemeHeâuelee (Šue) Deeve keâe ØeeeÙekeâlee evekeâeeueS~

(ix) Show that $\frac{\partial^r}{\partial t^r} M_x(t)$ gives r^{th} raw moment when t = 0.

eoKeeFÙe $\frac{\partial^r}{\partial t^r} M_x(t)$, rJee MevÙe keâ meehe#e DeeleCe oiee Ùeeo t = 0.

(x) If x ~ B (n,p) then show that,

Ùeeo x ~ B (n,p) lee eoKeeFÙe,

$$P\left\{\left|\frac{x}{n}-p\right| \geq \in\right\} \to 0 \text{ as } n \to \infty$$

9. State and prove Chebyshev's inequality. Explain its use.

eueeKeS leLee emeæ keâeepeS, ÛeyeeMeJe ØeceÙe keâe~ Fmekeâe GheÙeeie Yee mecePeeFÙe~

Unit-II

FkeâeF-II

4. What do you mean by random variable and its distribution?

If x and y have following joint distribution, test independence of x and y.

ÙeeÂeÛÚkeâ Ûej leLee Fmekeâ yešve me Deehe keÙee ele n?

Ùeeo x Deej y keâe meÙeòeâ yešve evecveeueeKele n, lee x Deej y keâe mJeleb$elee keâe hej#eCe keâeepeS~

$$f(x, y) = 4xy\,e^{-(x^2+y^2)} \;;\; x \ge 0,\ y \ge 0$$

5. (a) A Continuous r.v.x has a p.d.f. as follows. Find a and b such that :

A melele Ùee. Ûej x keâe Øee. le. Heâ. evecveeueeKele n~ a Deej b keâe ceeve evekeâeeueS epememe -

$$f(x) = 3x^2 ,\ 0 \le x \le 1$$

(i) $P\{x \le a\} = P\{x > a\}$

(ii) $P\{x > b\} = .05$

(b) If $f(x) = e^{-x}$ find third moment about mean. $(x > 0)$.

Ùeeo $f(x) = e^{-x}$, $x > 0$ lee ceeOÙe keâ meehe#e leeme je DeeleCe evekeâeeueS~

Unit-III

FkeâeF-III

6. (a) Find the expected number on a die when thrown.

(b) Let x and y be independent non-degenerate variates, Prove that

$$\text{Var }(x\,y) = \text{Var }(x).\ \text{Var }(y)$$

iff $E(x) = 0, E(y) = 0$

(a) ekeâmee heeme keâ Heâkeâve hej meYeeeJele meKÙee evekeâeeueS~

(b) Ùeeo x Deej y mJele$e Deej veeve-e[pevejš Ûej n, lee emeæ keâeepeS :

$$\text{Var }(x\,y) = \text{Var }(x).\ \text{Var }(y)$$

Ùeeo Deej keâJeue Ùeeo $E(x) = 0, E(y) = 0$

7. If Ùeeo 15

$$f(x,y) = \begin{cases} 2 - x - y & , \ 0 \le x < 1 \ , \ 0 \le y \le 1 \\ 0 & \text{otherwise} \ , \end{cases}$$ DevÙeLee

Find evekeâeeueS :

(i) $E(x), E(y)$

(ii) Var (x), Var (y)

(iii) Cov (x,y)

Unit-IV

FkeâeF-IV

8. Define M.G.F. and show the effect of change of origin and scale on it.

If $p(x) = {}^nC_x\, p^x\, q^{n-x}$, $x = 0, 1, 2, \ldots, n$, $p > 0$ then obtain m.g.f. of x.

DeeleCe pevekeâ Heâueve heejYeeeel e keâeepeS leLee Fme hej ceue SJe heejceehe keâ heejJeleve keâ ØeYeeJe keâe eoKeeFÙe~

Ùeeo $p(x) = {}^nC_x\, p^x\, q^{n-x}$, $x = 0, 1, 2, .., n$, $p > 0$ lee x keâe Dee.pe.Heâ. Øeehle keâeepeS~