be an estimate of θ based on a sample of size n. Show that T_n is consistent for θ if :

$$\lim_{n\to\infty} E(T_n) \to \theta \quad \text{and} \quad \lim_{n\to\infty} V(T_n) \to 0$$

Deekeâuekeâ keâe meieielee keâe heejYee<ee oeepe ~ Ùeeo $T_{n,}$ θ keâe Deekeâuekeâ n, pee n Deekeâej keâ ØeeleoMe hej DeeOeeej le n, lee emeæ keâæpeÙe ekeâ $T_{n,}$ θ keâe meiele Deekeâuekeâ neiee Ùeeo:

$$\lim_{n\to\infty} E(T_n) \to \theta \quad \text{leLee} \quad \lim_{n\to\infty} V(T_n) \to 0$$

3. (a) Find the maximum likelihood estimate of θ in :

$$f(x,\theta) = \frac{1}{\theta\sqrt{2\pi}} e^{\frac{-x^2}{2\theta^2}}; -\infty < x < \infty, \theta > 0$$

evecveeueeKele ce θ keâe DeeOekeâlece mecYeeeJelee Deekeâuekeâ eveekeâeeueÙe:

$$f(x,\theta) = \frac{1}{\theta\sqrt{2\pi}} e^{\frac{-x^2}{2\theta^2}}; -\infty < x < \infty, \theta > 0$$

(b) Specify the regularity conditions, state and prove Cramer-Rao inequality.

eveÙeecele heejemLeeleÙee keâe eveeo___________

Demeecekeâe keâe eueeKeÙe leLee emeæ keâeepeÙe~

A (Printed Pages 8)

S-703

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

MATHEMATICAL STATISTICS

First Paper

(Statistical Inference)

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

Note : Answer five questions in all. Question No. 1 and four other questions, selecting one question from each unit.

keâue heeÜe ØeMvee keâ Gòej oeepeS~ ØeMve me.1 leLee ØelÙekeâ FkeâeF me Skeâ ØeMve Ûevele nÙe DevÙe Ûeej ØeMvee keâ Gòej oeepeS~

1. (a) Explain the meaning of efficiency with an example.

Skeâ GoenjCe meenle o#elee keâe mecePeeFÙe~

(b) What do you understand by an estimator? Give an example.

Deekeâueve me Deehe keÙee mecePele n? Skeâ GoenjCe oeepeS~

(c) State the method of maximum likelihood estimation.

Deekeâueve keâe DeeOekeâlece mecYeeJelee eJeeOe yeleeFÙe~

(d) Explain critical region in testing of hypothesis.

heejkeâuhevee hejer#eCe ce ›eâeevleekeâ #e$e keâe eeFÙe~

(e) Differentiate between most powerful test and uniformly most powerful test.

meJeeòece hejer#eCe leLee meceeve®hee meJeeòece hejer#eCe ce Yeo yeleeFÙe~

(f) What do you mean by degrees of freedom?

mJele$elee keâeeš me Deehekeâe keÙee leelheÙe n?

(g) When and why do you pool the frequencies while testing goodness of fit?

Deemepeve mee‰Je keâ hejer#eCe nle keâye Deej keÙee Jeiee keâe meceneekeâjCe keânle n?

(h) State two applications of χ^2.

χ^2 keâ oe ØeÙeeiee keâe eueeKeÙe~

(i) Explain the principle underlying a large sample test.

yenle ØeeleoMe hejer#eCe ce eveenle emeæeele keâe mhe° ekeâjCe keâeepeÙe~

(j) How will you obtain the confidence interval for the variance of a normal population when mean unknown?

ØemeeceevÙe yešve ce ØemejCe keâ eueÙe eJeMJeemee Devlejeue keâme Øeehle keâjie Ùeeo ceeOÙe %eele ne~

Unit-I

FkeâeF-I

2. (a) For a random sample $x_1, x_2, \ldots, x_n$ from the population $N(\mu, \sigma^2)$, find unbiased estimates of μ and σ^2.

Skeâ meece° $N(\mu, \sigma^2)$ me Skeâ ÙeeÂeÛÚkeâ ØeeleoMe $x_1, x_2, \ldots, x_n$ keâ eueÙe μ leLee σ^2 keâ DeveeYevele Deekeâuekeâ evekeâeeueÙe~

(b) Define consistency of an estimator. Let T_n

9. Explain the theory and importance of variance stabilizing transformation with the help of transformation of correlation coefficient.

menmecyevOe ieCeekeâ keâ ®heevlejCe keâe meneÙelee me ØemejCe emLej keâjve Jeeue ®heevlejCee keâ emeæeôle SJe DeeJeMÙekeâlee keâe mecePeeFÙe~

Unit-II

FkeâeF-II

4. (a) Discuss the concept of errors in testing of hypothesis. How are they controlled while choosing the best critical region?

heejkeâuhevee hejer#eCe ce neve Jeeuee $eešÙee keâe eJeJeÛevee keâeepeS~ meyeme DeÛÚe meKÙee #e$e Ûeveve ce Fve $eešÙee hej keâme eveÙev$eCe ekeâÙee peelee n?

(b) Let there be 10 items, out of which θ are defectives. $H_0 : \theta = 5$ is rejected in favour of $H_1 : \theta = 4$ if two items selected with replacement are of same kind. Calculate α and β.

ceevee 10 JemleDee ce me θ Kejeye n~ heejkeâuhevee $H_0 : \theta = 5$ keâe $H_1 : \theta = 4$ keâ he#e ce DemJeekeâej ekeâÙee peelee n, Ùeeo oe JemleS 10 ce me Skeâ-Skeâ keâjkeâ evekeâeueve hej (henuee keâe Jeeheme jKeve keâ yeeo) Jen Skeâ pemee ne~ α leLee β keâe ieCevee keâeepeS~

5. State and prove Neyman-Pearson lemma. Use it to find test for $H_0 : \mu = 2$ against $H_1 : \mu = 4$ on the basis of a random sample of size 10 from $N(\mu, 4)$.

veceve-eheÙemeve ØeceeÙekeâe keâe euee Ke Ùe leLee emeæ keâeepeS~ Fmekeâe ØeÙeeie keâjle nÙe $H_0 : \mu = 2$ eJehejele $H_1 : \mu = 4$ keâe hejerë Ce evekeâeeueS peyeekeâ ØemeeceevÙe yeŠve $N(\mu, 4)$ me 10 ceehe keâe ÙeeÂeÛÚkeâ Øeele oMe eoÙee ne~

Unit-III

FkeâeF-III

6. (a) Give any two applications of student's t-distribution in testing of hypothesis.

heejkeâuhevee hejerë Ce ce mš[Cš t-yeŠve keâ ekeâvne oe DeveØeÙeeiee keâe mecePeeFÙe~

(b) Explain χ^2 - distribution in testing the hypothesis concerning independence of two attributes in a contingency table.

mecePeeFÙe ekeâ χ^2 - yeŠve heejkeâuhevee hejerë Ce ce oe ieCee keâ mJele$elee hejerë Ce keâe meejCee ce ekeâme ØeÙeeie ekeâÙee peelee n?

7. Mention the important features of F-distribution and a brief account of its applications in tests of hypothesis.

F-yeŠve keâe ØeceKe eJeMe<eleeS eueeKeS Deej heejkeâuhevee hejerë Ce ce Fmekeâ GheÙeeiee keâe mee#ehle eJeJejCe Øemlele keâeepeS~

Unit-IV

FkeâeF-IV

8. (a) Explain the likelihood ratio principle for testing of hypothesis.

heejkeâuhevee keâ hejerë Ce keâ eueÙe mecYeeJel Devehele emeæele keâe mecePeeFÙe~

(b) Obtain 95% confindence limits of θ in $N(\theta, 1)$.

$N(\theta, 1)$ ce θ keâ eueÙe 95% eJeMJeemÙelee meeceeS Øeehle keâeepeS~