

TRIBHUVAN UNIVERSITY

2081 (Regular)

Bachelor Level (4 Yrs.) / Science & Tech. / II Year Full Marks: 100
Probability and Inference -I (Stat. 201) Time: 3 hrs.

Candidates are required to give their answers in their own words as far as practicable.

The questions are of equal value.

GROUP "A"

Attempt any FOUR Questions

[4×10=40]

1. What is hypergeometric distribution? Derive mean and variance of this distribution.
2. Obtain moment generating function of Gamma distribution with parameter α . Also, show that its mean and variance are equal.
3. Derive student's t-distribution. obtain mean deviation from mean of t-distribution.
4. State and prove Cramer- Rao inequality. Find the condition for equality sign in C-R inequality.
5. Define type I and type II errors in hypothesis testing. Let P be the probability of getting a head in a single toss of a coin. The coin is tossed 5 times and its is desired to test $H_0 : p = \frac{1}{2}$ against $H_1 : p = \frac{2}{3}$. The H_0 is rejected if more than 3 heads are obtained. Find the probabilities of type I and type II errors.
6. Describe median test for two samples.

GROUP "B"

Attempt any EIGHT Questions

[8×5=40]

- 7 Show that Poisson distribution is a limiting case of negative binomial distribution.
8. Obtain the mean and variance of negative exponential distribution.
9. If the joint probability density function of (X, Y) is.
- $$f(x, y) = e^{-(x+y)} \quad ; \quad 0 < x < \infty, 0 < y < \infty$$
- $$= 0 \quad ; \quad \text{otherwise}$$

Examine whether two random variable X and Y are independent or not.

10. Let X and Y be two independent Poisson variance with parameters λ_1 and λ_2 respectively. Then find the distribution of the Sum $U = X + Y$.
11. ~~In~~ sampling with replacement from a normal population $N(\mu, \sigma^2)$ show that $E(r^2) = \sigma^2$.
12. Describe method of moments for estimating parameters of a distribution.
13. Obtain 100(1- α)% confidence interval for difference between two population means when σ_1^2 and σ_2^2 are unknown and equal.
14. Let x_1, x_2, \dots, x_n be a random sample drawn from $N(0, \sigma^2)$. Find the best critical region of size α for testing $H_0 : \sigma = \sigma_0$ against $H_1 : \sigma = \sigma_1$ If $\sigma_1 > \sigma_0$.
- 15 How do you carry out Wilcoxon signed rank test in case of one small sample.
16. Two independent random samples of unemployed men and women are drawn and the ages of the 4 women and 5 men are recorded as follows:

P.T.O.

Women	60	63	36	44	-
Men	53	39	22	33	24

Test whether there is a difference in the average age of unemployed men and women using Mann - Whitney U-test.

GROUP "C"

17. Attempt All Questions

[10×2=20]

- a) Find mean of sample mean.
 - b) Obtain recurrence relation for negative binomial distribution.
 - c) What is Laplace distribution?
 - d) What are the four main features of F-distribution?
 - e) What is consistent estimator?
 - f) Why is interval estimation important?
 - g) Distinguish between null hypothesis and alternative hypothesis.
 - h) Find the standard error of sample proportion.
 - i) What is power efficiency of a test?
 - j) When is Cochran - Q test applied?
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