

June 2017

Bachelor of Computer Application (BCA) Examination
II Semester

Statistics - II

Time 3 Hours]

[Max. Marks 40

Note : Attempt all the five questions. All questions carry equal marks.

1. (a) Explain the method of maximum likelihood for estimation and state important properties of maximum likelihood estimators.
(b) On the basis of a random sample of size n from $N(\mu, \sigma^2)$, obtain Maximum Likelihood Estimator (MLE) of (i) μ when σ^2 is known (ii) σ^2 when μ is known.

Check whether the MLE $\hat{\sigma}^2$ in (ii) is unbiased. Can you obtain

MLE of $e^{-\sigma^2}$ on the basis of $\hat{\sigma}^2$.

OR

Write short notes on (i) Cramer Rao Inequality and minimum variance estimates (ii) Unbiasedness, consistency and sufficiency properties of a good estimator.

2. State the Neyman Person's fundamental lemma and its important applications in statistical tests.

Use this lemma to obtain best critical region for testing $H_0: \theta = \theta_0$ against $H_1: \theta = \theta_1$ (where $\theta_1 > \theta_0$), on the basis of a random sample of size n from $N(\theta, \sigma^2)$ distribution, when σ^2 is known to be equal to 1.

OR

- (a) Explain giving examples, what are simple and composite hypotheses, What are statistical tests of hypotheses and why are there errors in such tests. What are errors of kind-I and kind-II and how are these related to size and power of a test.
(b) If $X \geq 1$ is the critical region for testing $H_0: \theta = 2$ against $H_1: \theta = 1$ on the basis of a single observation from a population with probability density function $f_0(x) = \theta e^{-\theta x}$, $x > 0$, find the power of the test.
3. Define Beta distribution. For Beta distribution of either Ist kind or second kind, derive the expressions for (a) μ_r , the r th moment about origin (b) Mean and variance (c) β_1 .

OR

- (a) Define t distribution and state two applications of Fisher's i -test.
(b) The following data gives life in hours of two batches of electric lamps. Test whether there is a significant difference between average lengths of life in the two batches, stating clearly the assumptions under which the test is valid. (Given : $t_{0.235, 13} = 2.16$, $t_{0.05, 13} = 3.012$).

	Life of Lamp in Hours							
Lamp No. :	1	2	3	4	5	6	7	8
Batch I :	1505	1556	1801	1629	1644	1607	1825	1748
Batch II :	1799	1618	1604	1655	1708	1675	1728	-

4. What are the advantages and disadvantages of non-parametric tests as compared to parametric tests. Explain in details (i) sign test (ii) Wilcoxon's signed rank test.

OR

Explain median test in details. Following are the independent samples of number of defective items produced by workman A and workman B :

Workman	Number of defectives produced
A	26, 27, 31, 26, 19, 21, 20, 25, 30
B	23, 28, 26, 24, 22, 19

Perform median test to check whether the two populations are identical.

5. For analysis of variance ANOVA of two way classification with one observation per cell, explain, giving an example, the concept, mathematical model, assumptions, hypotheses to be tested, formulae used and write the ANOVA table.

OR

What are Latin Square Designs (LSD) ? Give the layout of a 4×4 LSD. Give an example of application of LSD in field experiments. Explain how the basic principles of design of experiments are met in LSD. Compare and contrast LSD with randomized block designs.

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