B. Sc. DEGREE END SEMESTER EXAMINATION - MARCH 2020

SEMESTER – **4: STATISTICS (COMMON FOR MATHEMATICS AND COMPUTER APPLICATIONS)**

COURSE: **15U4CPSTA4-15U4CRCST4, STATISTICAL INFERENCE**

(For Regular - 2018 Admission and Supplementary / Improvement 2017, 2016, 2015 Admissions)

Time: Three Hours   Max. Marks: 75

(Use of Scientific calculators and Statistical tables permitted)

PART A

*Answer **all** questions. Each question carries **1** mark.*

1. Define statistic and sampling distribution.
2. What are the different methods of estimation?
3. State Fisher Neyman factorization Theorem.
4. Define confidence coefficient.
5. Define critical region.
6. State Neyman Pearson fundamental lemma.
7. Define power of a test.
8. What is meant by degrees of freedom?
9. How is efficiency of an estimator related to its variance?
10. What are the two types of errors in testing of hypothesis?   (1 x 10 = 10)

PART B

*Each question carries **3** marks. Maximum marks from this part is **15***

11. Write the procedure of testing a hypothesis.
12. Define an unbiased estimator. Show that the sample mean is an unbiased estimator of the population mean.
13. What do you understand by the terms testing of hypothesis and level of significance?
14. How is an interval estimator different from a point estimator?
15. Distinguish between one-tailed test and two-tailed tests.
16. What are the two types of errors in testing of hypothesis?
17. Write down the test statistics and critical region for testing the mean of a population $H_0: \mu = \mu_0$, when the population variance is unknown.

PART C

*Each question carries **5** marks. Maximum marks from this part is **20***

18. Define sufficient estimator. For a Poisson distribution with parameter θ, show that sample mean $\bar{X}$ is the sufficient estimator of θ.

19. State Cramer-Rao inequality. What is its importance?

20. Explain the large sample test of the equality of the means of two populations.

21. Find the mle of θ in the distribution $f(x,\theta) = \theta x^\theta, 0 < x < 1, \theta > 0 = 0, elsewhere$

22. What is the contribution of standard error in testing of hypothesis?

23. Write the confidence interval for the difference between proportions of two populations?

PART D

*Each question carries **10** marks. Maximum marks from this part is **30***

24. A sample of height of 6400 Bangladeshis has a mean of 67.85 inches and a standard deviation of 2.56 inches, while sample of height of 1600 Indians has a mean 68.55 inches and a standard deviation of 2.52 inches. Do the data indicate that Indians are on the average taller than Bangladeshis?

25. 400 labourers were selected at random from a certain district. Their mean income was 140.5 per day, with standard deviation 25.2 rupees. Set up 95% confidence limits with which the income of the labour community of district is expected to lie.

26. (i) State and prove the sufficient condition for consistency of an estimator.

    (ii) If T is a consistent estimator for θ, then show that T^2 is also a consistent estimator for θ^2

27. 1000 students at college level are graded according to their I.Q .and their economic conditions. Test whether there is any association between economic conditions and the level of I.Q.

<table>
<tr><th rowspan="2"></th><th rowspan="2"></th><th colspan="4">IQ Level</th></tr>
<tr><th>Poor</th><th>Average</th><th>Good</th><th>Total</th></tr>
<tr><td rowspan="4">Income Level</td><td>Poor</td><td>150</td><td>100</td><td>50</td><td>300</td></tr>
<tr><td>Average</td><td>200</td><td>150</td><td>150</td><td>500</td></tr>
<tr><td>Well-to-do</td><td>50</td><td>100</td><td>50</td><td>200</td></tr>
<tr><td>**Total**</td><td>**400**</td><td>**350**</td><td>**250**</td><td>**1000**</td></tr>
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