



বিদ্যাসাগর বিশ্ববিদ্যালয়
VIDYASAGAR UNIVERSITY

Question Paper

B.Sc. Honours Examinations 2020

(Under CBCS Pattern)

Semester - III

Subject: STATISTICS

Paper: GE3T & GE3P

(Basics of Statistical Inference)

Full Marks : 60

Time : 3 Hours

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

The figures in the margin indicate full marks.

THEORY

Attempt any *two* questions from the following :

2×20=40

- (a) Define Chi-square distribution. State important properties of Chi-square distribution.
- (b) Show that t-distribution is a symmetric distribution.
- (c) Find mean and mode of F-distribution with (m, n) degrees of freedom. Hence, comment on the skewness of the distribution. (3+5)+3+(6+3)=20

2. (a) Suppose r balls are placed in n cells. Let f_i be the number of balls in i th cell, $i = 1, 2, \dots, n$ and $\sum_{i=1}^n f_i = r$. Describe a large sample test to the hypothesis that balls are placed randomly (all cells are equally probable to get a ball)

(b) To examine the efficiency of a coronavirus vaccine a pharmaceutical company conducted the following experiment:

Among ' n ' volunteers ' m ' were given the vaccine and remaining ' $n-m$ ' got a placebo. Let ' a ' among ' m ' volunteers got affected by coronavirus despite taking vaccine and ' c ' among the remaining ' $n-m$ ' volunteers got affected by coronavirus. Give a large sample test to test the efficiency of the vaccine. 8+12=20

3. (a) Define the following items:

Type - I error, Type - II error, size and power of a statistical test.

(b) Let X_1, X_2, \dots, X_n be a random sample from a normal distribution with unknown mean μ and known variance σ^2 . Obtain a test procedure for testing $H_0 : \mu = \mu_0$ against $H_1 : \mu = \mu_1 (> \mu_0)$. 10+10=20

4. (a) Let X_1, X_2, \dots, X_n be a random sample from a normal distribution with unknown mean μ and unknown variance σ^2 . Obtain a test procedure for testing $H_0 : \mu = \mu_0$ against $H_1 : \mu > \mu_0$.

(b) Let (X_1, X_2, \dots, X_m) and (Y_1, Y_2, \dots, Y_n) be two independent random samples from $N(\mu_1, \sigma_1^2)$ and $N(\mu_2, \sigma_2^2)$, respectively, where σ_1^2 and σ_2^2 are known. Obtain a test procedure for testing $H_0 : \mu_1 = \mu_2$ against $H_1 : \mu_1 > \mu_2$. 10+10=20

5. (a) Discuss about the basic principle of design of experiments.

(b) What is analysis of variance? How do you partition the total sum of squares for a one way classified data?

(c) Write the ANOVA table for a one way classified data for 35 observations and 4 classes containing 10, 7, 12, 6 observations respectively. 7+6+7=20

PRACTICAL

Attempt any *one* question from the following :

1×20=20

1. (a) A random sample of size 10 was taken from a normal population, whose variance is known to be 7.056 sq. inches. If the observations are (in inches) 65, 71, 64, 71, 70, 69, 64, 63, 67 and 68, test the hypothesis that the population mean is 69 inches against two-sided alternative.
- (b) The following data are the lives in hours of 2 batches of electric lamps. Test whether there is a significant difference between the batches in respect of average length of life.

Batch 1	Batch 2
1505	1899
1556	1619
1801	1603
1629	1655
1644	1708
1617	1673
1835	1727

10+10=20

2. (a) Use sign test to examine whether the following sample is drawn from population with median '0' or greater than '0'

– 1.65, 0.86, 0.58, 0.004, 0.39, – 1.45, – 0.08, 1.47, 0.23, 0.21.

It is given that $\tau_{0.05} = 1.64$.

- (b) A bird watcher sitting in a park has spotted a number of birds belonging 6 categories. The exact classification is given below

Category	1	2	3	4	5	6
Frequencies	6	7	13	17	6	5

Test at five percent level of significance whether or not the data is compatible with the assumption that this particular park is visited by birds belonging to these six categories in the proportion 1 : 1 : 2 : 3 : 1 : 1.

Given that $\chi_{0.05,5}^2 = 11.07$.

8+12=20

3. Three brands of batteries are under study. It is suspected that the lives (in weeks) of the three brands are different. Ten randomly selected batteries of each brand are tested with the following results:

Life in weeks		
Brand 1	Brand 2	Brand 3
100	76	108
96	80	100
92	75	96
96	84	98
92	82	100
98	81	103
94	77	102
95	83	88
97	78	110
93	83	99

Are the lives of these brands of batteries different?

20
