# 2019

## STATISTICS

( Major )

Paper : 6·1

### ( Statistical Inference–2 )

*Full Marks* : 60

*Time* : 3 hours

*The figures in the margin indicate full marks for the questions*

1. Choose the correct answer : 1×7=7

   (a) In a testing of hypothesis, power of a test is

   (i) the probability of accepting a hypothesis when it is true

   (ii) the probability of rejecting a hypothesis when it is false

   (iii) the probability of accepting a hypothesis when it is false

   (iv) None of the above

   (b) In a sign test, we use

   (i) only the sign of the differences

   (ii) only the magnitude of the differences

   (iii) both the magnitude and sign of the differences

   (iv) None of the above

( *Turn Over* )

(c) In a testing of hypothesis problem, we try to fix

(i) the type-II error and minimize type-I error

(ii) the type-I error and maximize type-II error

(iii) the type-I error and maximize the power of the test

(iv) None of the above

(d) In a testing of hypothesis problem for a normal distribution, if we specify the mean but not the variance, then it will be the case of

(i) simple hypothesis

(ii) composite hypothesis

(iii) alternative hypothesis

(iv) None of the above

(e) The Neyman-Pearson lemma

(i) always gives us the uniformly most powerful (UMP) test

(ii) sometimes gives us the UMP test

(iii) never gives us the UMP test

(iv) None of the above

(f) The Kolmogorov-Smirnov test statistic

(i) uses the concept of empirical distribution

(ii) never uses the concept of empirical distribution

(iii) sometimes uses the concept of empirical distribution

(iv) None of the above

(g) Suppose we put forward an interval which we expect would include the true parametric value, then the process is called

(i) testing of hypothesis

(ii) non-parametric inference

(iii) interval estimation

(iv) None of the above

2. Answer the following questions :  2×4=8

(a) Define type-I and type-II errors.

(b) Define Kendall's $\tau$.

(c) State the Neyman-Pearson lemma.

(d) Define the most powerful test.

3. Answer any *three* of the following questions :

5×3=15

(a) Let $p$ be the probability that a coin will fall in head in single toss in order to test $H_0 : p = \dfrac{1}{2}$ against $H_1 : p = \dfrac{1}{4}$. The coin is tossed 5 times and $H_0$ is rejected, if more than 3 heads are obtained. Find the probability of type-I error and the power of the test.

(b) Write an explanatory note on sign test.

(c) Write a note on likelihood ratio test.

(d) Write notes on non-parametric and distribution-free tests.

4. Answer any *three* of the following questions :

$10 \times 3 = 30$

(a) Describe any non-parametric test consisting of two samples.

(b) (i) Write an explanatory note on confidence interval.     6

(ii) Describe briefly the run test.     4

(c) (i) State the advantages of Kolmogorov-Smirnov one-sample statistic over chi-square test.     3

(ii) Suppose you are testing $H_0 : \lambda = 2$ against $H_1 : \lambda = 1$, where $\lambda$ is the parameter of the Poisson distribution. Obtain the best critical region of the test.     7

(d) Describe how you will test the equality means of two univariate normal distributions using likelihood ratio test.

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