SE – 171

Fourth Semester B.Sc. Examination, September 2020
(CBCS) (Fresh+Repeaters) (2018-19 and Onwards)
STATISTICS – IV
Statistical Inference – II

Time : 3 Hours Max. Marks : 70

Instructions : *i) Answer **any ten** sub-questions from Section – **A** and **five** questions from Section – **B**.*
*ii) Scientific calculators are **allowed**.*

SECTION – A **(20 marks)**

I. Answer **any ten** of the following questions : **(10×2=20)**

1) a) Define simple and composite hypothesis with examples.

b) Define the terms :

i) Critical region.

ii) Critical function of a test.

c) Explain normal test of significance.

d) Write the test statistic for testing the equality of two proportions.

e) State the conditions for the validity of Chi-square test for goodness of fit.

f) Define Yule's coefficient of association.

g) Distinguish between parametric and non parametric test.

h) Define a RUN. Write the number of runs in the following sequence

XXYYYXXXYYXYXXXYYXXYXXY

i) Define Mann Whitney U-test statistic.

j) Explain the test for randomness.

k) Write the test statistic for Spearman's rank correlation coefficient in non-parametric test.

l) Write the expression for stopping bounds in a sequential probability ratio test.

P.T.O.

SECTION – B (50 marks)

II. Answer **any five** questions from the following : **(5×10=50)**

2) a) Let X_1, X_2, X_3 be a random sample from Poisson $P(\lambda)$ distribution. It is required to test $H_0 : \lambda = 2$ V/s $H_1 : \lambda = 4$ and H_0 is rejected if $\sum_{i=1}^{3} X_i \geq 3$. Obtain probabilities of type – I and type II errors.

b) Distinguish between randomized and non-randomized tests.

c) It is required to test a certain null hypothesis by using the test function

$$\phi(x_1, x_2) = \begin{cases} 1 & \text{if } \bar{x} > 2.5 \\ 0 & \text{if } \bar{x} < 2.5 \end{cases}. \text{ If}$$

i) $x_1 = 1.5$ and $x_2 = 2.5$.

ii) $x_1 = 3.5$, $x_2 = 5.5$ and $x_3 = 2.5$ are random samples from continuous distribution, then what is your decision. **(4+2+4)**

3) a) Derive most powerful (MP) test of level α for testing $H_0 : \lambda = \lambda_0$ against $H_1 : \lambda = \lambda_1 (>\lambda_0)$ based on a random sample of size n from Poisson population with parameter λ.

b) Obtain an MP test of level α for testing $H_0 : \mu = \mu_0$ against $H_1 : \mu = \mu_1 (>\mu_0)$ based on a random sample of size 'n' from normal population $N(\mu, 1)$. Also obtain the power function. **(5+5)**

4) a) Explain the test procedure for testing $H_0 : P = P_0$ against $H_1 : P \neq P_0$, where P is the binomial population proportion.

b) Describe the large sample test procedure for testing $H_0 : \mu_1 = \mu_2$ against $H_1 : \mu_1 \neq \mu_2$ where μ_1 and μ_2 are the population means of normal population. **(5+5)**

5) a) Explain paired t-test.

b) Explain the Chi-square test for testing population variance. **(5+5)**

6) a) Explain the test procedure for testing the hypothesis $H_0 : \rho = \rho_0$ where ρ is the population correlation coefficient.

b) Explain Chi-square test for independence of attributes. **(5+5)**

7) a) Discuss the test procedure for testing regression coefficient.

b) Illustrate the procedure for Chi-square test for goodness of fit. **(5+5)**

8) a) Describe sign test for two independent samples.

b) Explain Median test. **(5+5)**

9) a) Describe Sequential Probability Ratio Test (SPRT).

b) Derive the SPRT for testing $H_0 : \mu = \mu_0$ V/s $H_1 : \mu = \mu_1$ $(\mu_1 > \mu_0)$ in $N(\mu, \sigma^2)$ distribution (σ^2 is known). **(5+5)**