

9. Write short notes on any *two* of the following :

- (a) Kruskal Wallis test
- (b) Mood test
- (c) Siegel-Tukey test.

7½, 7½

Roll No. ....

Total Pages : 04

**CMDQ/D-23**  
**INFERENCE-II**  
**ST-302**

**6522**

Time : Three Hours]

[Maximum Marks : 75

**Note** : Attempt *Five* questions in all, selecting *one* question from each Unit. Q. No. 1 is compulsory.

**Compulsory Question**

1. Briefly discuss the following :

- (a) Simple and composite hypothesis with at least one example of each.
- (b) Power function of a test.
- (c) Uniformly most powerful test
- (d) Distinguish between 'Sign test' and 'Wilcoxon signed rank test'
- (e) Procedure for testing 'Goodness of fit'
- (f) The following represent a random sample :  
2.5, 3.2, 1.7, 0.6, 12.7, 13.4, 20, 0.1, 1.7, 13.4.  
Obtain the empirical distribution function
- (g) Bootstrap method
- (h) Sukhatme test.

2,2,2,2,1,2,2,2

### Unit I

2. (a) State and prove Neyman-Pearson lemma.  
(b) Define and give an example of the following characteristics of an estimator :  
Unbiasedness and Sufficiency. **8,7**
3. (a) Derive the UMP test for testing  $H_0 : \theta \leq \theta_0$  against  $H_1 : \theta > \theta_0$ , given a sample of size  $n$  from exponential distribution  $f(x) = \frac{1}{\theta} e^{-x/\theta}$ ,  $0 \leq x < \infty$ ,  $\theta > 0$ .  
(b) Obtain a best critical region for testing  $H_0 : \sigma = \sigma_0$  against  $H_1 : \sigma = \sigma_1$ ,  $\sigma_1 > \sigma_0$ , in case of  $N(0, \sigma^2)$ . Obtain the expression for the power function. **7,8**

### Unit II

4. (a) Define : (i) Complete sufficient statistic, with example (ii) Likelihood ratio test and its applications.  
(b) Show that the likelihood ratio test for testing the equality of variances of two normal distributions is the usual F-test. **8,7**
5. (a) Describe SPRT. Develop SPRT of strength  $(\alpha, \beta)$  for testing  $H_0 : p = p_0$ , where  $p$  is the parameter of binomial distribution.

- (b) Define OC and ASN functions associated with Wald SPRT and derive them for testing  $H_0 : p = p_0$  against  $H_1 : p = p_1$ , where  $p$  is the parameter of the binomial distribution. **7,8**

### Unit III

6. (a) Define Empirical Distribution Function and its properties. Also, given a random sample of size 25, using normal approximation, obtain 95 percent confidence interval for population median.  
(b) Define : (i) Kendall's Tau coefficient (ii) Spearman's rank correlation. **8,7**
7. (a) Work out the test statistic for testing randomness based on the total number of runs.  
(b) State the purpose of using Kolmogorov-Smirnov one sample Test. Describe Test Procedure of it for small samples. Mention changes in procedure for large sample. **7,8**

### Unit IV

8. (a) Discuss the two sample location problem. Describe the Wilcoxon rank sum test and the Mann-Whitney U-test for this problem.  
(b) Define the Wald-Wolfowitz run test. For which testing problem is it used ? **8,7**