

FOURTH SEMESTER B.C.A. DEGREE EXAMINATION, APRIL/MAY 2005

(Vocational Course)

Optional Subject—Statistics

Paper VIII—TESTING OF HYPOTHESIS

Time : Three Hours

Maximum : 90 Marks

Each unit carries 50 marks.

Not more than 30 marks will be awarded from each unit.

Statistical tables will be provided on request.

Unit I

1. Explain why there are two type of errors in a statistical hypothesis ? (4 marks)
2. Explain the terms :
 - (a) Size of a test.
 - (b) Level of significance.
 - (c) Power of the test.
 - (d) Most powerful test.

(6 marks)
3. State and prove Neymann-Pearson lemma. (8 marks)
4. Let X_1, X_2, \dots, X_n be a random sample from a normal population with mean μ and variance. Find the most powerful size- α test for $H_0 : \mu = 10$ versus $H_1 : \mu = 25$. (8 marks)
5. Let $X_1 \geq 2$ be the critical region for testing $H_0 : \theta = 1$ against the alternative $H_1 : \theta = 3$ on the basis of a single observation X_1 from the population.

$$f(x, \theta) = \begin{cases} \frac{1}{\theta} e^{-x/\theta}, & 0 < x < \infty \\ 0, & \text{elsewhere} \end{cases}$$

Obtain the chances of type I and type II errors and power of the test.

(8 marks)

6. Let X_1, X_2, \dots, x_n be a random sample from a normal distribution with unknown mean μ and variance 4. Use likelihood ratio test to obtain the best critical region of size α , under $H_0 : \mu = 0$ against $H : \mu > 0$. (8 marks)
7. Explain the advantages of parametric test over non-parametric tests. (4 marks)
8. Define power function and explain its use in testing hypothesis. (4 marks)

Turn over

Unit II

9. Explain the role of central limit theorem in large sample tests. (4 marks)
10. It is known that the survival rate from a certain disease for the entire population is 80%. However, in a sample of 100 old patients only 72 survived. Will you accept the hypothesis that the survival rate of the elderly people is less than that of the entire population at 5% level of significance? (7 marks)

11. Samples of workers were drawn from two factories and from them wages/day in Rupees, means, and standard deviation are calculated. Make a large sample test to test the significance of the difference between the wages in the two factories :—

		Mean	S.D.	Size of the sample
Factory A	∴	122	42	200
Factory B	∴	128	50	350

(7 marks)

12. (a) Explain the testing procedure to test the significance of correlation coefficient.
(b) What do you mean by paired *t*-test?

(7 marks)

13. A certain baby food given to each of the 14 babies resulted in the following increase in body weights :—

2	1.2	-0.5	1.7	-1.1	0.5	-0.7
1.8	0.9	-0.7	2.2	-1.2	1.4	-0.4

Can it be concluded that use of the baby food increase the weights of babies?

(8 marks)

14. Explain the F-test to test the equality of population variances. State the assumptions clearly. (5 marks)
15. Discuss the χ^2 -test of goodness of fit of a theoretical distribution to an observed frequency distribution. (5 marks)

16. 1025 college students were classified according to their intelligence and economic conditions. Test whether economic condition and intelligence of the students are independent :

		Intelligence		
		Excellent	Good	Not good
Economic conditions	Good	55	190	252
	Not good	75	180	273

(7 marks)

Unit III

17. Let X_1, X_2, \dots, X_n be a random sample from the p.d.f. $f(x) = \begin{cases} 2x, & 0 < x < 1 \\ 0, & \text{elsewhere} \end{cases}$. Derive the p.d.f.s of $Y = \max. (X_1, X_2, \dots, X_n)$ and $Z = \min. (X_1, X_2, \dots, X_n)$. (8 marks)
18. Explain the main advantages of non-parametric tests. (4 marks)
19. What do you mean by a run ? Explain Wald-Wolfowitz run test. (6 marks)
20. Derive the sign test, stating clearly the assumptions made. (6 marks)
21. The Win-Lose record of a cricket team for the last 30 consecutive games was as follows :
W W L L L L W W L W L L W W W L W L W W L W L L L W W L W W
Apply run test to test the sequence of wins (W) and loses (L) are random. (6 marks)
22. Explain Mann-Whitney-Wilcoxon test. Obtain the mean and variance of the test statistics. (7 marks)
23. Explain Kolmogorov-Smirnov two sample test. (7 marks)
24. Describe the median test for two sample location problem. (6 marks)