

D 401

M.B.A. DEGREE EXAMINATION, APRIL/MAY 2003.

First Semester

BA 100 — STATISTICS FOR MANAGEMENT

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

Use of calculator and statistical tables is permitted.

PART A — (10 × 2 = 20 marks)

1. The compressive strength of samples of cement can be modelled by a normal distribution with a mean of 6000 kilograms per square centimeter and a standard deviation of 100 kilograms per square centimeter. What strength is exceeded by 95% of the samples? *unit 2*
2. What is an estimator? *unit 2*
3. A manufacturer is interested in the output voltage of a power supply used in a PC. Output voltage is assumed to be normally distributed with standard deviation 0.25 V and the manufacturer wishes to test $H_0 : \mu = 5V$ against $H_1 : \mu \neq 5V$, using $n = 8$ units. Find the power of the test for detecting a true mean output voltage of 5.1 V. *unit-2*
4. If 12 determinations of the specific heat of iron have a standard deviation of 0.0086, test the $H_0 : \sigma = 0.010$ for such determinations. Use the $H_1 : \sigma \neq 0.010$ and $\alpha = 0.01$. *unit-3*
5. Explain the meaning and use of analysis of variance. *unit-3*

6. How do the non-parametric methods differ from parametric methods? *unit 4*
7. What is correlation? Point out the significance of its study to the students of Business Administration. *unit-5*
8. Distinguish between trend, seasonal variations and cyclical fluctuations in a time series. *unit 5*
9. Explain the following term : Acceptance and Rejection regions. *unit 3*
10. A random sample of size 16 has 53 as mean. The sum of the squares of the deviations taken from the mean is 150. Can this sample be regarded as taken from the population having 56 as mean? *unit-3*

PART B — (5 × 16 = 80 marks)

11. An experiment was run to determine whether four specific firing temperatures affect the density of a certain type of brick. The experiment led to the following data.

Temperature (°F)	Density							
100	21.3	21.9	21.7	21.6	21.7	21.5	21.8	
125	21.7	21.4	21.5	21.5	—	—	—	
150	21.9	21.8	21.8	21.6	21.5	—	—	
175	21.9	21.7	21.8	21.7	21.6	21.8	—	

Does the firing temperature affect the density of the bricks? Use significance level = 0.05.

12. (a) (i) What is student's t -distribution? Discuss the importance of it. (6) *unit-3*
- (ii) The weight of a sophisticated running shoe is normally distributed with a mean of 12 ounces and a standard deviation of 0.5 ounce. *unit-1*

- (1) What is the probability that a shoe weighs more than 13 ounces?
- (2) What must the standard deviation of weight be in order for the company to state that 99.9% of its shoes are less than 13 ounces? (10)

Or

- (b) (i) A random sample of 100 teachers in a large metropolitan area revealed a mean weekly salary of Rs. 4,870 with a standard deviation of Rs. 480. With what degree of confidence can we assert that the average weekly salary of all teachers in the metropolitan area is between Rs. 4,720 and Rs. 5,020? *unit 21* (8)

- (ii) A trucking firm is suspicious of the claim that the average lifetime of certain tires is at least 28,000 miles. To check the claim, the firm puts 40 of these tires on its trucks and gets a mean lifetime of 27,463 miles with a standard deviation of 1,348 miles. What can it conclude if the probability of a Type I error is to be at most 0.01? (8)
unit 3

13. (a) (i) The following random samples are measurements of the heat-producing capacity (in millions of Calories per ton) of specimens of coal from two mines :

Mine I : 8260 8130 8350 8070 8340

Mine II : 7950 7890 7900 8140 7920 7840

Use the 0.01 level of significance to test whether the difference between the means of these two samples is significant. (6)

- (ii) The following is the distribution of the hourly number of trucks arriving at a Company's warehouse :

Trucks arriving

per hour : 0 1 2 3 4 5 6 7 8

Frequency : 52 151 130 102 45 12 5 1 2

Find the mean of this distribution and using it (rounded to one decimal place) as the parameter λ , fit a Poisson distribution.

Unit-4

Test for goodness of fit at the 0.05 level of significance. (10)

Or

Unit-1

(b) (i) A study shows that 16 of 200 tractors produced on one assembly line required extensive adjustments before they could be shipped, while the same was true for 14 of 400 tractors produced on another assembly line. At the 0.01 level of significance, does this support the claim that the second production line does superior work? (6)

(ii) Test of the fidelity and the selectivity of 190 radio receivers produced the results shown in the following table.

Unit-4

		Fidelity		
		Low	Average	High
Selectivity	Low	6	12	32
	Average	33	61	18
	High	13	15	0

Use the 0.01 level of significance to test whether there is a relationship between fidelity and selectivity. (10)

14. (a) Suppose that in a study of sedimentary rocks, the following diameters (in millimeters) were obtained for two kinds of sand :

Sand I : 0.63 0.17 0.35 0.49 0.18 0.43 0.12
 0.20 0.47 1.36 0.51 0.45 0.84 0.32 0.40
 II : 1.13 0.54 0.96 0.26 0.39 0.88 0.92 0.53
 1.01 0.48 0.89 1.07 1.11 0.58

Unit-4

D 401

Use the U-test at the 0.01 level of significance to test the null hypothesis that the two samples come from identical populations against the alternative hypothesis that the populations are not identical.

Or

- (b) The following are the numbers of misprints counted on pages selected at random from three Sunday editions of a newspaper :

April 11 : 4 10 2 6 4 12

April 18 : 8 5 13 8 8 10

April 25 : 7 9 11 2 14 7

Use the H -test at the 0.05 level of significance to test the null hypothesis that the 3 samples come from identical populations.

15. (a) Price x and advertising expenditure z are possible explanatory variables for sales y . The following data are available from six test market areas.

Sales y	Price x	Expense z
(units)	(Rs.)	(Rs.)
1000	10	100
1080	9	120
1200	9	200
1020	10	50
910	11	0
850	12	50

Determine the regression equation. Interpret the constants in terms of this problem.

Or

(b) Fit a constant percentage growth trend to the following quarterly data :

Period	Value	Period	Value
1	52	13	63
2	58	14	72
3	40	15	56
4	49	16	61
5	57	17	69
6	61	18	77
7	43	19	59
8	54	20	70
9	65	21	77
10	70	22	82
11	49	23	60
12	56	24	74

units

