P 164

M.B.A. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2003.

First Semester

BA 100 — STATISTICS FOR MANAGEMENT

Time . Three hours Maximum : 100 marks

Use of statistical tables and calculator permitted.

Answer ALL questions.

PART A — ($10 \times 2 = 20$ marks)

1. Give the mean and standard error of the proportion of defectives in a random sample from a population containing defectives and non defectives. Unit 2

2. Let X_1, X_2 and X_3 be a random sample of size 3 from a population with mean μ and variance σ^2. Let T_1, T_2 and T_3 be estimators used to estimate μ Unit-2

$$T_1 = X_1 + X_2 - X_3, T_2 = 2X_1 + 3X_2 - 4X_3, T_3 = \frac{X_1 + X_2 + X_3}{3}$$

Which is the best estimator? Unit-2

3. The variance of a normal population is 2.5. On the basis of a random sample of size 10, it is proposed to test $H_0 : \mu = 25$ against $H_A : \mu = 27.5$. Find P (Type I error) for the critical region $\{\overline{X}: 25.665 < \overline{X} < 25.865\}$. Unit-2

4. Show that the sum of two independent chisquare variates is also a chisquare variate. Unit-4

5. If X_1, X_2, X_3 and X_4 are independent observations from standard normal population, what is the sampling distribution of $V = \frac{3X_4^2}{X_1^2 + X_2^2 + X_3^2}$. Unit-2

6. A random sample of size 25 are taken from a normal population with $\mu = 49.5$ and $\sigma^2 = 1.69$. Find the probability that the mean of this sample falls between 48.75 and 50.10. Unit 2

7. Define the two types of errors in testing a statistical hypothesis. Unit 3

8. If ρ is the correlation coefficient between X and Y, find the correlation coefficient between $aX + b$ and $cY + d$ where a, b, c, and d are scalars. Unit 5

9. Define the statistic used in the U test and give its mean. Unit-4

10. Describe the seasonal variation and cyclical fluctuations in a time series. Unit 5

PART B — ($5 \times 16 = 80$ marks)

11. (i) In a partially destroyed laboratory record of an analysis of correlation data, the following results only were legible

Var $(X) = 9$, Regression Equations : $8X - 10Y + 66 = 0$, $40X - 18Y - 214 = 0$ what were Unit 5

(1) the mean values of X and Y

(2) the correlation coefficient between X and Y

(3) the s.d. of Y. (8)

(ii) A computer while calculating correlation coefficient between two variables X and Y from 25 pairs of observations gave the following :

$n = 25, \Sigma X = 125, \Sigma X^2 = 650, \Sigma Y = 100, \Sigma Y^2 = 460, \Sigma XY = 508$

It was later discovered that at the time of checking the pair

X	Y
6	14
8	6

Unit-5

was fed while the correct values were

X	Y
8	12
6	8

obtain the correct value of the correlation coefficient. (8)

12. (a) (i) Let $X_1, X_2 \ldots X_n$ be random sample from a normal population with mean μ and variance σ^2. Find the sampling distribution of the sample mean $\overline{X}$. unit 2 (6)

(ii) A random sample of size 9 is obtained from a normal population with $\mu = 25$. If the sample variance is equal to 100, find the probability that the sample mean exceeds 31.2. unit 2 (6)

(iii) A normal population has a mean of 0.1 and a s.d. of 2.1. Find the probability that the mean of a sample of size 900 will be negative. (4)

unit 2

Or

(b) (i) On the basis of a random sample of size n, find the maximum likelihood estimators of μ and σ^2, the parameters of the normal density function. (8)

(ii) Show that $\overline{X}$, the sample mean is an unbiased estimator of μ, the population mean, while $S^2 = \frac{\Sigma(X_i - \overline{X})^2}{n}$ is always a biased estimator of σ^2, the population variance. unit-2 (8)

13. (a) (i) Define the power of a statistical test procedure. (4)

(ii) Two sample polls of voters for two candidates A and B are taken, one each from the residents of rural and urban areas. Examine whether the area is related to their voting preference. (12)

Votes for → / Area ↓	A	B
Rural	620	380
Urban	550	450

unit-4

Or

(b) (i) In two large populations, there are 30 and 25 percent respectively of blue-eyed people. Is this difference likely to be hidden in samples of 1200 and 900 respectively from the two populations? unit-3 (8)

(ii) Fit a Poisson distribution to the following data and test for goodness of fit. (8)

X	0	1	2	3	4	5	6
f	275	72	30	7	5	2	1

unit-4

14. (a) The following are the number of mistakes made in 5 successive days by 4 technicians working for a photographic laboratory test at a level of significance $\alpha = 0.01$ whether the differences among the four sample means can be attributed to chance (16)

unit-3

Technician I	Technician II	Technician III	Technician IV
6	14	10	9
14	9	12	12
10	12	7	8
8	10	15	10
11	14	11	11

Or

(b) Twelve children one each selected from 12 sets of identical twins, were trained by a certain method A and the remaining 12 children were trained by method B. At the end of the year, the following I.Q. scores were obtained :

Unit-4

Pair	1	2	3	4	5	6	7	8	9	10	11	12
Method A	124	118	127	120	135	130	140	128	140	126	130	126
Method B	131	127	135	128	137	131	132	125	141	118	132	129

Is this sufficient evidence to indicate a difference in the average IQ scores of the two groups? (16)

15. (a) (i) The projected number of women of child bearing age (15-49) for India from 1978 to 1985 are as follows :

Year	1978	1979	1980	1981	1982	1983	1984	1985
No. of women (in millions)	152.6	156.4	160.3	164.4	168.5	172.7	176.9	181.2

Unit-5

Fit a trend line. (12)

(ii) Discuss the different methods for determining seasonal variation in a time series. (4)

Or

(b) (i) The price of a certain commodity during 1980 to 1983 were as follows :

Year	Jan.-Mar.	April-June	July-Sept.	Oct.-Dec.
1980	321	348	348	348
1981	327	351	354	348
1982	342	359	381	345
1983	364	390	401	385

Unit-5

Compute the seasonal indices by the method of simple averages and find the deseasonalised values. (8)

(ii) The following table gives the total expenditure of the Government during 1978-1985. Fit a quadratic trend to the data :

Year	78-79	79-80	80-81	81-82	82-83	83-84	84-85
Expenditure	177.2	185.0	224.9	254.0	304.9	359.9	438.8

Unit 5

(8)