

First year Diploma in Operation Research for Management
Paper II - Statistics for Management

Con. 2250-08.

BB-8965

(3 Hours)

11/08 [Total Marks : 100

- N.B. :** (1) Attempt any **five** questions.
 (2) **All** questions carry **equal** marks.
 (3) Statistical **tables** and **graph** papers will be supplied on request.
 (4) Use of **non-programmable** calculator is **allowed**.

1. The daily profits in rupees of 100 shops are distributed as follows :-

Profit per shop	No. of shops
0 - 100	5
100 -	7
200 -	18
300 -	27
400 -	20
500 -	17
600 - 700	6
Total	100

Calculate the arithmetic mean, mode, the lower quartile and the standard deviation (s.d.) of the distribution.

2. (a) Explain with the help of suitable diagrams the concept of positive, negative and lack of correlation between two variables.
- (b) A firm believes that its annual profits (y) depend on its expenditure on research (x), in Rs. 1000. The following table presents the information for the preceding 6 years :

Year	2002	2003	2004	2005	2006	2007
x	2	3	5	4	6	10
y	20	25	34	30	31	40

- (i) Calculate the product moment correlation coefficient and comment on its value.
 (ii) Determine the equation of the appropriate line of regression and use it to estimate the annual profits when the expenditure on research is Rs. 7,000 in the year.
3. (a) State the probability density functions and the properties of the following statistical distribution :-
- Poisson
 - Normal and
 - Exponential.

Explain the 'forget fullness' property and the distribution for which it is applicable.

- (b) In a Restaurant, on a particular morning the amounts spent on breakfast by customers follow a normal distribution with average of Rs. 22.50 and s.d. of Rs. 2.
- Estimate the proportion of days on which customers spent between Rs. 20.50 and Rs. 24.50 on breakfast.
 - If on a given morning 540 customers spent Rs. 20 or more on breakfast, what is the total number of customers served ?

Con. 2250-BB-8965.

4. (a) The number of articles produced on 55 old and 45 new machines gave the following results :-

Machines	No. of machines	Mean	S.D.
Old	55	60	10
New	45	50	6

- (i) Find the combined mean and coefficient of variation for both machines together.
- (ii) Determine whether the number of articles produced on new machines are more uniform than those on old machines.

(b) Two random samples of sizes 10 and 20 are drawn from two normal populations. The sample variances are 25 and 36 respectively. Can we regard the two normal population variances to be equal ?

5. (a) The probability of an article being defective is given to be 0.2. What is the probability that a random sample of eight articles will have (i) 2 defectives (ii) fewer than 2 defectives?

(b) The life of a certain type of electronic part is known to follow an exponential distribution with a mean of 3 weeks. What is the probability that a given part will have a life of more than 5 weeks ?

(c) A chemist claims that his medicine is effective in curing 90% of the patients suffering from flue. To test the claim the medicine was given to 300 patients and 261 were cured. Test his claim at the 1% level of significance. Also determine the 99% confidence limits for the true percentage of the cured patients.

6. (a) The consumer preference for four brands of a product are given below :-

Brand	A	B	C	D	Total
No. of persons	30	20	40	10	100

- (i) Test the hypothesis that the consumer preferences are equal.
- (ii) Test the hypothesis that the brand C is preferred by as many persons as the other three brands examined.
Use a 1% level of significance.

(b) In a time-study, 10 timings of a particular element were as follows :-
18, 16, 14, 19, 20, 15, 17, 16, 10, 13.
Calculate 95% confidence limits for the true average time for this element.

7. (a) Describe briefly the utility of control charts in industry. Describe the working of the X and R charts.

(b) The life in hours of three brands of electric bulbs is given below :-

Brand :

A	: 1200	1300	1350		
B	: 1200	1350	1400	1400	
C	: 1100	1200	1300	1400	1450

Test at the 5% level whether there is a significant difference among the means of the three brands.

8. Write short notes on any **three** :-

- (a) Measures of Skewness
- (b) Type I and Type II errors
- (c) Components of a time-series
- (d) Paired t-test.