AST-01

ASSIGNMENT BOOKLET
Bachelor's Degree Programme
(B.Sc./B.A./B.Com.)

STATISTICAL TECHNIQUES

Valid from 1st January, 2024 to 31st December, 2024

- **It is compulsory to submit the Assignment before filling in the Term-End Examination Form.**
- **It is mandatory to register for a course before appearing in the Term-End Examination of the course. Otherwise, your result will not be declared.**

For B.Sc. Students Only

- **You can take electives (56 or 64 credits) from a minimum of TWO and a maximum of FOUR science disciplines, viz. Physics, Chemistry, Life Sciences and Mathematics.**
- **You can opt for elective courses worth a MINIMUM OF 8 CREDITS and a MAXIMUM OF 48 CREDITS from any of these four disciplines.**
- **At least 25% of the total credits that you register for in the elective courses from Life Sciences, Chemistry and Physics disciplines must be from the laboratory courses. For example, if you opt for a total of 24 credits of electives in these 3 disciplines, then at least 6 credits out of those 24 credits should be from lab courses.**

School of Sciences
Indira Gandhi National Open University
Maidan Garhi, New Delhi-110068

(2024)

Dear Student,

Please read the section on assignments in the Programme Guide for Elective Courses that we sent you after your enrolment. A weightage of 30 per cent, as you are aware, has been earmarked for continuous evaluation, **which would consist of one tutor-marked assignment** for this course. The assignment is in this booklet.

Instructions for Formatting Your Assignments

Before attempting the assignment please read the following instructions carefully.

1) On top of the first page of your answer sheet, please write the details exactly in the following format:

ROLL NO.: ……

NAME: ……

ADDRESS: ……

……

……

COURSE CODE: …….

COURSE TITLE: …….

ASSIGNMENT NO.: ……..…

STUDY CENTRE: ……..….. **DATE:** …….……...

PLEASE FOLLOW THE ABOVE FORMAT STRICTLY TO FACILITATE EVALUATION AND TO AVOID DELAY.

2) Use only foolscap size writing paper (but not of very thin variety) for writing your answers.

3) Leave 4 cm margin on the left, top and bottom of your answer sheet.

4) Your answers should be precise.

5) While solving problems, clearly indicate which part of which question is being solved.

6) This assignment is to be submitted to the Study Centre as per the schedule made by the study centre. **Answer sheets received after the due date shall not be accepted.**

   We strongly suggest that you retain a copy of your answer sheets.

7) This assignment is valid only upto December, 2024. If you have failed in this assignment or fail to submit it by December, 2024, then you need to get the assignment for the year 2025 and submit it as per the instructions given in the programme guide.

8) **You cannot fill the Exam Form for this course** till you have submitted this assignment. So solve it and **submit it to your study centre at the earliest.**

We wish you good luck.

Assignment

Course Code: AST-01
Assignment Code: AST-01/TMA/2024
Maximum Marks: 100

1. a) The data on chicks born in a farm are given below for 60 days. Compute the mean and standard deviation by doing a frequency distribution:

2, 3, 4, 5, 2, 1, 6, 0, 7, 8, 0, 2, 1, 4, 5, 1, 5, 4, 1, 2, 1, 2, 0, 4, 2, 3, 1, 0, 8, 9, 1, 3, 4, 5, 6, 0, 2, 3, 2, 0, 0, 1, 2, 9, 8, 7, 3, 9, 8, 7, 0, 1, 2, 0, 7, 6, 2, 1, 0, 3.

(Take class width = 2) (4)

b) If $P(A) = 0 \cdot 50$, $P(B) = 0 \cdot 40$ and $P(A \cup B) = 0 \cdot 70$, find $P(A \mid B)$ and $P(A^c \cup B)$, where A^c is the complement of A. State whether A and B are independent. Justify your answer. (4)

c) The average monthly sales of 5000 firms are normally distributed. Its mean and standard deviation are Rs. 36,000 and Rs. 10,000, respectively. Find

(i) the number of firms the sales of which are over Rs. 40,000.

(ii) the percentage of firms, the sales of which will be between Rs. 38,500 and Rs. 41,000. (2)

2. a) The mean salary paid to 500 employees working in a firm was found to be Rs. 180.40. After disbursement of salaries for a certain month, it was discovered that the salary of two employees was wrongly entered as Rs. 297 and Rs. 165 against their correct salary of Rs. 197 and Rs. 185, respectively. Find the correct mean salary. (3)

b) Draw a less than type give curve for the data given below. Use the curve to find out the number of companies getting profits between Rs. 45 crores and Rs. 75 crores.

Profits (Rs. Crores)	No. of Companies	Profits (Rs. Crores)	No. of Companies
10-20	8	60-70	10
20-30	12	70-80	7
30-40	20	80-90	3
40-50	24	90-100	1
50-60	15		

(5)

c) An incomplete frequency distribution is given as follows:

C.I.	Frequency
10-20	12
20-30	30
30-40	?
40-50	65
50-60	?
60-70	25
70-80	18

Given that the median value of 200 observations is 46, determine the missing frequencies using the median formula. (2)

3. a) A random sample of male employees is taken at the end of a year and the mean number of hours of absenteeism for the year is found to be 63 hours. A similar sample of 50 female employees has a mean of 66 hours. Could these samples be drawn from a population with the same mean and standard deviation of 10 hours? (Use $\alpha = 5\%$) (4)

b) Write two situations where systematic sampling is appropriate. Justify your choice of situations. Also explain how it is different from stratified sampling. (4)

c) Assuming that it is true that 2 in 10 industrial accidents are due to fatigue, find the probability that exactly 2 of 8 industrial accidents will be due to fatigue. (2)

4. a) A sample of 25 items is selected from a very large shipment. It is found to have a mean weight of 310 gm and standard deviation equal to 9 gm. State and compute the 95% confidence limits for the population mean weight. (4)

b) In a University, 20% of all students are graduates and 80% are undergraduates. The probability that a graduate student is married is 0.5 and the probability that an undergraduate student is married is 0.1. One student is selected at random. What is the probability that (i) he/she is married (ii) the student is a graduate if he/she is found to be married? (6)

5. a) Consider a random sample (WOR) of two industries from a population of 5 industries having yearly turnover as follows:

Industry	**Turnover (in lakhs)**
1	2000
2	2400
3	1800
4	3000
5	2600

Enumerate all possible samples (WOR) of size two and show that the sample mean gives an unbiased estimate of population mean. (4)

b) The following data represents the sale (Rs. 1,000) per month of 3 brands of a toilet soap allocated among 3 cities:

	Cities		
Brands	**A**	**B**	**C**
I	42	48	30
II	42	54	57
III	29	42	29

At 5% level of significance, test whether the mean sales of 3 brands are equal. (6)

6. a) Assume that on an average one telephone number out of 15 is busy. Which probability distribution can be used to find the probability that if 6 randomly selected telephone numbers are called, not more than three will be busy? Find the probability. (4)

b) To test the desirability of a certain modification in computer operators selection desks, 9 operators were given two similar tests, one on the desk already in use and the other on the new one. The following difference in the number of words typed per minute were recorded

Typist	A	B	C	D	E	F	G	H	I
Increase in the No. of words	2	4	0	3	-1	4	-3	2	3

Use appropriate test to judge whether the data indicate that the modification in desk promotes speed in computer typing? (6)

7. a) Do the forecasting by applying simple exponential smoothing procedure to the following data. Take $\omega = 0 \cdot 15$:

Year	**No. of Branches**
2001	5
2002	3
2003	3
2004	4
2005	3
2006	6
2007	4

(6)

b) There are 50 fields in a village, sown with wheat and each is divided into 8 plots of equal size. Out of the 50 fields, 5 are selected by SRSWOR method. Again from each selected field, 2 plots are chosen by SRSWOR method. The yield in kg/plot recorded is as given in the following table:

Selected Field	**Plot-I**	**Plot-II**
1	4·16	4·76
2	5·40	3·52
3	4·12	3·73
4	4·38	5·67
5	5·31	2·59

Estimate the average yield of all the 50 plots. (4)

8. a) Compute the appropriate regression equation for the following data:

X (Independent Variable)	**Y (Dependent Variable)**
2	18
4	12
5	10
6	8
8	7
11	5

Also find the correlation coefficient between X and Y and infer about the relationship between X and Y. (5)

b) Suppose that a given lot of manufactured items contains 20% defective items. If a sample of 10 items is selected from the lot, find the probability that

i) atmost 7 items are defective

ii) at least 6 items are defective (5)

9. a) 20 samples each of size 10 were inspected. The number of defectives detected in each of them is given below:

0, 1, 0, 3, 9, 2, 0, 7, 0, 1, 1, 0, 0, 3, 1, 0, 0, 2, 1, 0

Find the control limits for the number of defectives and establish quality standards for the future. Plot the graph and interpret. (6)

b) From the following data, calculate the 4-yearly moving average and determine the trend values:

Year	**Production ('000 tonnes)**
1983	614
1984	615
1985	652
1986	678
1987	681
1988	655
1989	717
1990	719

(4)

10. State whether the following statements are *true* or *false*. Give brief justification. (10)

a) The probability of getting a sum of 8 or more in a simple throw with two dice is 15/36.

b) A 95% confidence interval is smaller than 99% confidence interval.

c) For a population of 5 household, using circular systematic sampling, at most 10 samples of sample size 2 can be selected.

d) Yearly data in a time series are dependent on the effects of seasonal variations.

e) If the two regression coefficients are 0.8 and 0.6, the coefficient of correlation is – 0.69.