AST-01

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

STATISTICAL TECHNIQUES

Valid from 1st January, 2020 to 31st December, 2020

- **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

(2020)

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: ……

……

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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, 2020. If you have failed in this assignment or fail to submit it by December, 2020, then you need to get the assignment for the year 2021 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/2020
Maximum Marks: 100

1. State whether the following statements are *true* or *false*. Give brief justification. (5×2=10)

   a) If two variables are independent, then the coefficient of correlation between them is 1.

   b) The mean of a binomial distribution is 10 and the standard deviation is 4.

   c) Simple random sampling is done by using random number where the probability of drawing a digit is 0.1.

   d) The number of six digit telephone numbers generated with distinct digits is $(9)^6$.

   e) If 25 is subtracted from each value of X and Y and then divided by 10, the new b'_{yx} is 2.5 times of b_{yx}, where b_{yx} is a regression coefficient of Y on X.

2. a) The mean and standard deviation of a characteristic of 100 items were found to be 60 and 10, respectively. At the time of calculations, two items were wrongly taken as 5and 45 instead of 30 and 20. Calculate the corrected mean and standard deviation. (3)

   b) A person speaks the truth 3 out of 4 times. A die is thrown. She reports that there is five. What the chance that there was five? (3)

   c) In a normal distribution, 10% of the items are over 125 and 35% are under 60. Find the mean and standard deviation of the distribution. (4)

3. a) 500 students selected at random from 1500 students enrolled in a computer crash programme were classified according to the age and grade points giving the following data:

	Age (in years)		
Grade Point	**Below 20**	**21-30**	**Above 30**
Up to 5	30	50	20
5.1 to 7.5	80	70	50
7.6 to 10.0	40	80	80

   Test at 5% level of significance that age and grade points are independent. (5)

   b) An executive makes on an average 5 telephone calls per hour at a cost which may be taken as Rs. 2 per call. Determine the probability that in any hour, the cost of the telephonic calls (i) exceeds Rs. 6, (ii) remains less than Rs. 10. (5)

4. a) Of the 200 people selected randomly from a large city, 120 were found to be in favour of a more liberal traffic laws. Obtain a 95% confidence interval of the proportion of the people in the city who favour more liberal traffic laws. (3)

   b) The following data represents the production (in Kg.) of three varieties of wheat P, Q and R shown as:

P:	14	16	18		
Q:	14	13	15	22	
R:	18	16	19	15	20

Is there any significant difference among the production of these varieties at 5% level of significance? (7)

5. a) The number of defects in 20 carpets are given as 2,0,4,1,0,8,0,1,2,0,6,0,2,1,0,3,2,1, 0,2. Find the suitable control limits and plot them on the graph and interpret the results. (6)

b) The life time of 10 electric bulbs (in thousands of hours) are as follows:

2, 3, 2, 3, 2, 3, 4, 4, 3, 4

Determine an unbiased estimate of the population mean and standard deviation. (4)

6. a) A sample of size 3 is to be selected from a population of 10 households. List all the possible samples by:

i) Linear Systematic Sampling
ii) Circular Systematic Sampling

Also compare the two. (3)

b) Given the following bivariate data:

X:	-1	5	3	2	1	1	7	3
Y:	-6	1	0	0	1	2	1	5

Calculate a regression line of Y on X and use the regression line to find Y, if $X = 10$. (7)

7. a) A manufacturer wishes to determine the effectiveness of four types of machines A, B, C and D in the production of bolts. For this, the number of defective bolts produced by each machine on two alternative days are shown in the following table:

	Day I	Day II
Machine A	24	30
Machine B	41	44
Machine C	32	31
Machine D	28	38

Perform an analysis of variance method to determine whether there is a difference between machines, at 5% level of significance. (5)

b) The yearly water consumption in a small city for ten years is given below. Determine the trend values by using a 3-yearly moving average.

Year	Water Consumption (in thousand gallons)
2007	26
2008	27

2009	28
2010	30
2011	29
2012	27
2013	30
2014	31
2015	32
2016	31

Plot the values and interpret the result. (5)

8. a) The following contingency table presents the analysis of 300 persons according to hair colour and eye colour:

Hair Colour	Eye Colour		
	Blue	Grey	Brown
Burgundy	30	10	40
Brown	40	20	40
Black	50	30	40

Test the hypothesis that there is an association between hair colour and eye colour at 5% level of significance. (7)

b) The information regarding production of wheat (in thousand kg) in 25 districts is collected for a particular season. Select a possible systematic random sample of 7 units from the data given below (using appropriate method):

23, 20, 30, 37, 76, 36, 13, 36, 16, 58, 53, 83, 10,
15, 13, 17, 12, 16, 17, 21, 20, 18, 61, 31, 71. (3)

9. a) Both husband and wife appear in an interview for two vacancies for the same post. The probabilities of husband's and wife's selections are $\frac{2}{5}$ and $\frac{1}{5}$, respectively.

Find the probability that

i) exactly one of them is selected,
ii) at least one of them is selected. (4)

b) A company produces electric bulbs. To estimate the average life of the electric bulbs, the quality inspector of the company selects 80 bulbs randomly. She finds that the average life of these bulbs is 50 hours. Find the population average life of the electric bulbs produced by the company using 95% confidence limits. (4)

c) Give two examples, with justification, of situations where cluster sampling can be used. (2)

10. a) For the following series of observations, calculate the trend values by the exponential smoothing method with $a_0 = 10{,}000$ and weight $= 0.3$:

Year	Annual Sales (Rs. '000)
2008	2
2009	6
2010	1
2011	5
2012	3
2013	7
2014	2
2015	6
2016	4

Interpret the result. (7)

b) If two dice are thrown, what is the probability that the sum is

i) greater than 9, and
ii) neither 10 nor 12 ? (3)