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

STATISTICAL TECHNIQUES

Valid from 1st January, 2022 to 31st December, 2022

- **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.

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THE PEOPLE'S
UNIVERSITY

School of Sciences
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Maidan Garhi, New Delhi-110068

(2022)

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, 2022. If you have failed in this assignment or fail to submit it by December, 2018, then you need to get the assignment for the year 2023 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

1. a) The distribution of a discrete random variable X is given as :

X	P(X = x)
0	K
1	3K
2	0·2
3	K
4	2K + 0·1

Find :
(i)   The value of K
(ii) $P(X > 2)$
(iii) $E(X)$
(iv) Draw a rough sketch of the distribution.   (5)

b) For overall quality improvement of cloth, a textile manufacturer decides to monitor the number of defects in each bolt of cloth. The data from 10 inspections is reported as follows :

Both of Cloth	Numbers of Defects
1	8
2	19
3	5
4	11
5	2
6	8
7	7
8	13
9	3
10	2

Draw an appropriate control chart to check whether the process is under statistical control.   (5)

2. a) Three dice are rolled. If no two dice show the same number on the top face, what is the probability that one dice shows '1' on the top face?

b) If 2% of the books bound at a certain binary have defective bindings, determine the probability that 5 of 400 books bound by this binary will have defective bindings.   (3)

[Given that $e^{-8} = 0·00034$]

3. a) Out of 20,000 customers' leader accounts, a sample of 600 accounts was taken to test the accuracy of posting and balancing wherein 45 mistakes were found. Determine the 95% confidence interval for number of defective cases.   (3)

b) In 16 one-hour test runs, the gasoline consumption of an engine on an average is found to be $16 \cdot 4$ gallons with a standard deviation of $2 \cdot 1$ gallons. At 5% level of significance, test the claim that the average gasoline consumption of this engine is $12 \cdot 0$ gallons per hour (3)

c) A sample of 100 employees is to be drawn from a population of collages A and B. The population means and population mean squares of their monthly wages are given below :

College	N_i	$\overline{X}_i$	S_1^2
Collage A	300	25	25
Collage B	200	50	100

Determine the sample size to be taken using (i) proportional allocation, and (ii) Neyman allocation methods. (4)

4. a) A company has sales (y) which shows profit on the cost of production (x) of furniture when sold to government agencies. The regression lines are $y = x + 5$ and $16x = 9y + 95$.

Find :

(i) Mean of sale and production cost.
(ii) Correlation coefficient between sales and production cost.
(iii) If $\sigma_y = 4$, find σ_x.
(iv) Predict the production cost when sale is 2,000. (6)

b) An oil company claims that less than 20% of all the car owners have not tried its oil. Test the claim at the $0 \cdot 01$ level of significance if a random check reveals that 22 of 200 car owners not tried its oil. (4)

5. a) The odds that a research monograph will be accepted by 3 independent referees are 3 to 2, 4 to 3 and 2 to 3, respectively. Find the probability that of the three reports : (4)

(i) all will be accepted.
(ii) more than 1 of the reports will be favorable.

b) A company installed 10000 electric bulls in a metro. If these bulbs have an average life of 1000 hours with S. D of 200 hours. Assuming normality, what number of bulls might be expected to fail (i) in the first 800 hours (iii) between 800 and 1200 hours. (3)

c) Cite *two* situations where systematic sampling is appropriate. Explain, how it is different from stratified sampling. Justify. (3)

6. a) A random sample is selected from each of three types of ropes and their breaking strength (in pounds) are measured with the following results :

I	II	III
70	100	60
72	110	65
75	108	57
80	112	84
83	113	87
	120	73
	107	

Test whether the breaking strength of the ropes differs significantly at 5% level of significance. (6)

b) Works out the 5-yearly moving average for the data of a number of commercial industrial failures in a country during 7985 to 2000 : (4)

Year	No. of Failures	Year	No. of Failures
1985	223	1993	209
1985	226	1994	213
1987	228	1995	211
1988	232	1996	214
1989	220	1997	212
1990	212	1998	209
1991	212	1999	203
1992	210	2000	201

7. a) A cigarette company interested in the effect of gender on the type of cigarettes smoked and has collected the following data from a random sample of 150 persons :

Cigarette	Male	Female	Total
A	25	30	55
B	40	15	55
C	30	10	40
Total	95	55	150

At 95% level of significance, test whether the type of cigarette smoked and gender are independent. (5)

b) The lifetime (in '000 hours) of five LED bulbs of 10 watts are 46, 40 48, 50 and 42. Draw all possible random samples of size 3 without replacement and estimate the average lifetime of the LED bulbs. (5)

8. a) Following frequency distribution presents the lifetimes of 200 incandescent lamps : (5)

Class Interval	Number of Lamps
500—700	08
700—800	11
800—900	25
900—1000	58
1000—1100	41
1100—1200	43
1200—1300	8
1300—1500	6

Draw the histogram, 'more than' and 'less than' ogive. Also, find the median from the ogives.

b) Draw all the possible samples of sizes 2 without replacement from the population $\{8, 12, 20\}$ and verify that the sample mean $\overline{X}$ is the unbiased estimator of population mean. Find the variance of the estimate the population mean. (5)

9. a) Suppose that a testing procedure A results in 20 unacceptable transistors out of 100 produced whereas another testing procedure B results in 12 unacceptable transistors out of 100 produced. Can we conclude at 5% level of significance that the two methods are equivalent? (5)

b) Two different sampling techniques were adopted while investigating the same group of students to find the number of students falling in different intelligence level. The results are tabulated as follows :

Sampling Techniques	No. of Students				Total
	Below Average	Average	Above Average	Genius	
X	86	60	44	10	200
Y	40	33	25	2	100
Total	126	93	69	12	300

At 5% of level of significance, test whether the sampling techniques adopted significantly different ? (5)

10. Which of the following statements are *True* and *False* ? Justify your answers. (5×2=10)
a) If $b_{xy} = 0.9$ and $b_{yx} = -0.9$, then $r = 0.81$.

b) If a pair of dice is thrown, then the probability that the sum of the number on the top faces is greater than 12 is 0.

c) If the probability of being left-handed is 0.1, then the probability that none of the 3 persons selected randomly is left-handed is 0.729.

d) Analysis of variance is a technique to test the equality of variation in several populations.

e) If the level of significance is the same, the area of the rejection in a 2-tailed test is less than in a 1-tailed test.