

### ASSIGNMENT 3

- The probability that a bomb dropped from a plane will hit the target is **0.2**. If **6** bombs are dropped, find the probability that
  - exactly two will hit the target
  - at least two will hit the target.

2. Show that Poisson distribution is a limiting case of Binomial distribution when  $n$  is very large and  $p$  is small such that  $np$  is fixed. Also, using Poisson distribution, find the chance that out of **2,000** individuals more than two will get a bad reaction, if the probability of a bad reaction from a certain injection is **0.001**.

- In a normal distribution, **7%** of the items are under **35** and **89%** are under **63**. Find the mean and S.D. of the distribution? Given that

$$P(0 \leq Z \leq 0.18) = 0.07, \quad P(0 \leq Z \leq 1.48) = 0.43, \quad P(0 \leq Z \leq 1.23) = 0.39$$

- By the method of least squares, fit a straight line  $y = mx + c$  from the following data:

<b>x :</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
<b>y :</b>	<b>14</b>	<b>13</b>	<b>9</b>	<b>5</b>	<b>2</b>

- By the method of least squares, fit a parabola from the following data:

<b>x :</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
<b>y :</b>	<b>2</b>	<b>6</b>	<b>4</b>	<b>5</b>	<b>2</b>

- Two random variables have the regression lines with equation  $3x + 2y = 26$  and  $6x + y = 31$ . Find the mean values of  $x$  and  $y$ . Also, find the correlation coefficient between  $x$  and  $y$ .

- If  $\theta$  is the acute angle between two regression lines, show that

$$\tan \theta = \frac{1 - r^2}{r} \cdot \frac{\sigma_x \sigma_y}{\sigma_x^2 + \sigma_y^2}, \text{ where } \sigma_x \text{ and } \sigma_y \text{ are the S.D.'s of } x \text{ and } y\text{-series}$$

respectively and  $r$  is the correlation coefficient.

- The equations of two lines of regression are  $4x + 3y + 7 = 0$  and  $3x + 4y + 8 = 0$ . Find the regression coefficients  $b_{yx}$ ,  $b_{xy}$  and the correlation coefficient  $r$ . Also, find the standard deviation of  $y$ , if the variance of  $x$  is **4**.

- Find the coefficient of correlation for the data:

$$n = 10, \sum x = 20, \sum y = 40, \sum x^2 = 240, \sum y^2 = 410, \sum xy = 200.$$

- Calculate the rank correlation coefficient from the following data showing ranks of **5** students in two subjects:

<b>Maths :</b>	<b>3</b>	<b>2</b>	<b>4</b>	<b>1</b>	<b>5</b>
<b>Chemistry :</b>	<b>5</b>	<b>4</b>	<b>3</b>	<b>2</b>	<b>1</b>

#### ASSIGNMENT 4

1. A normally distributed population has means **6.8** and standard deviation **1.5**. A sample of size **400** has mean **6.75**. Is the difference between the population mean and the sample mean significant?
2. The means of two large samples of **1000** and **2000** members are **168.75** cm and **170** cm respectively. Can the samples be regarded as drawn from the same population of standard deviation **6.25** cm?
3. A machinist is making engine parts with axle diameter of **0.7** inch. A random sample of **10** parts shows mean diameter **0.742** inch with a standard deviation of **0.04** inch. On the basis of this sample, would you say that the work is inferior?
4. A sample of nine items has the following values: **45, 47, 50, 52, 48, 47, 49, 53, 51**. Does the mean of sample differ significantly from the population mean **47.5**?
5. A tea company claims that its premium tea brand outsells its normal brand by **10%**. If it is found that **46** out of a sample of **200** tea-users prefer premium brand and **19** out of another independent sample of **100** tea users prefer normal brand. Test the validity of the claim made by the company at **5%** level of significance.
6. The theory predicts the proportion of beans in four groups *A, B, C* and *D* should be **9:3:3:1**. In an experiment among **1600** beans, the numbers in four groups were **882, 313, 287** and **118**. Does the experimental result support the theory? (Given that  $\chi^2_{0.05}$  for 3 d.f. = **7.815**)
7. Two samples of sizes **9** and **8** give the sum of squares of deviations from their respective means as **160** and **91** square units respectively. Test whether the samples can be regarded as drawn from two normal populations with the same variance.
8. A survey of **800** families with four children each recorded the following data:

No. of boys:	0	1	2	3	4
No. of girls:	4	3	2	1	0
No. of families:	32	178	290	236	64

Test the hypothesis that male and female births are equally likely.

9. Two gauge operations are tested for precision in making measurements. One operator completes a set of **26** readings with a standard deviation of **1.34** and the other does **34** readings with a standard deviation of **0.98**. What is the level of significance of this difference? (Given that for  $\nu_1 = 25$  and  $\nu_2 = 33$ ,  $z_{0.05} = 0.305$ ,  $z_{0.01} = 0.432$ )
10. Two random samples from two normal populations are given below:

Sample I :	16	26	27	23	24	22
Sample II:	33	42	35	32	28	31

Do the estimates of population variances differ significantly?

( Given that  $F_{0.05}(5,5) = 5.05$ ,  $F_{0.05}(5,6) = 4.39$ ,  $F_{0.05}(6,5) = 4.95$  )

### ASSIGNMENT 5

1. A company manufactures two types of cloth, using three different colors of wool. One yard length of type **A** cloth requires 4 oz of red wool, 5 oz of green wool and 3 oz of yellow wool. One yard length of type **B** cloth requires 5 oz of red wool, 2 oz of green wool and 8 oz of yellow wool. The wool available for manufacturer is 1000 oz of red wool, 1000 oz of green wool and 1200 oz of yellow wool. The manufacturer can make a profit of Rs. 5 on one yard of type **A** cloth and Rs. 3 on one yard of type **B** cloth. Formulate this problem as a linear programming problem to find the best combination of the quantities of type **A** and type **B** cloth which gives him maximum profit.

2. Using graphical method, solve the following L.P.P.

$$\begin{aligned}\text{Min } Z &= x_1 + x_2 \\ \text{s.t. } x_1 + 2x_2 &\leq 10 \\ x_1 + x_2 &\geq 1 \\ x_1 &\leq 4 \\ x_1, x_2 &\geq 0.\end{aligned}$$

3. Using graphical method, find the maximum value of

$$\begin{aligned}Z &= 2x + 3y \\ \text{s.t. } x + y &\leq 30 \\ y &\geq 3 \\ x &\geq y \\ 0 \leq x &\leq 20 \\ 0 \leq y &\leq 12.\end{aligned}$$

4. Convert the following L.P.P. to the standard form:

$$\begin{aligned}\text{Max } Z &= 2x_1 + 3x_2 + 5x_3 \\ \text{s.t. } 6x_1 - 3x_2 &\leq 5 \\ 3x_1 + 2x_2 + 4x_3 &\geq 10 \\ 4x_1 + 3x_3 &\leq 2 \\ x_1, x_2 &\geq 0\end{aligned}$$

5. Solve the following L.P.P. by simplex method

$$\begin{aligned}\text{Max } Z &= 5x_1 + 3x_2 \\ \text{s.t. } 3x_1 + 5x_2 &\leq 15 \\ 5x_1 + 2x_2 &\leq 10 \\ x_1, x_2 &\geq 0\end{aligned}$$

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6. Solve the following L.P.P. by simplex method

$$\begin{aligned} \text{Min } Z &= x_1 - 3x_2 + 3x_3 \\ \text{s.t. } 3x_1 - x_2 + 2x_3 &\leq 7 \\ 2x_1 + 4x_2 &\geq -12 \\ -4x_1 + 3x_2 + 8x_3 &\leq 10 \\ x_1, x_2, x_3 &\geq 0 \end{aligned}$$

7. Write the dual of the following problem:

$$\begin{aligned} \text{Max } Z &= 4x_1 + 9x_2 + 2x_3 \\ \text{s.t. } 2x_1 + 3x_2 + 2x_3 &\leq 7 \\ 3x_1 - 2x_2 + 4x_3 &= 5 \\ x_1, x_2, x_3 &\geq 0 \end{aligned}$$

8. Using dual simplex method solve the following L.P.P.

$$\begin{aligned} \text{Max } Z &= -3x_1 - 2x_2 \\ \text{s.t. } x_1 + x_2 &\geq 1 \\ x_1 + x_2 &\leq 7 \\ x_1 + 2x_2 &\geq 10 \\ x_2 &\geq 3 \\ x_1, x_2 &\geq 0 \end{aligned}$$

9. An engineer wants to assign 3 jobs  $J_1, J_2, J_3$  to three machines  $M_1, M_2, M_3$  in such a way that each job is assigned to some machine and no machine works on more than one job. Find the optimal solution using Hungarian method if the cost matrix is as follows:

	$M_1$	$M_2$	$M_3$
$J_1$	15	10	9
$J_2$	9	15	10
$J_3$	10	12	8

10. Solve the following transportation problem by VAM method

		Destination				
Source	From\To	A	B	C	D	Availability
	I	21	16	25	13	11
	II	17	18	14	23	13
	III	33	27	18	41	19
	Requirement	6	10	12	15	43