

Table : 4

Determination of Control Limits from Ten Samples of Five Each

Sample number	1	2	3	4	5	6	7	8	9	10
	3.05	2.99	3.04	3.02	3.01	3.03	3.01	3.03	2.94	2.98
	3.02	2.97	3.00	3.04	2.95	3.03	3.04	3.02	2.98	2.99
	3.03	2.99	3.05	2.97	2.96	3.05	3.05	3.04	3.04	3.03
	2.98	3.01	2.95	3.06	3.04	2.99	3.04	3.05	3.01	3.02
	3.04	3.02	3.03	3.01	3.00	2.96	3.03	3.05	2.99	3.00
Total	15.12	14.98	15.07	15.10	14.96	15.06	15.17	15.19	14.96	15.02
average	3.024	2.996	3.014	3.02	2.992	3.012	3.034	3.038	2.992	3.004
range	0.07	0.05	0.10	0.09	0.09	0.09	0.04	0.03	0.10	0.05

$$\text{Grand average } \bar{\bar{x}} = \frac{\sum_{i=1}^{i=10} \bar{x}_i}{10} = \frac{30.126}{10} = 3.013$$

$$\text{Average range, } \bar{R} = \frac{\sum_{i=1}^{i=10} R_i}{10} = \frac{0.71}{10} = 0.071$$

$$\text{Upper control limit for } \bar{x} = \bar{\bar{x}} + A_2 \bar{R} = 3.013 + (0.58)(0.071) = 3.054$$

$$\text{Lower control limit for } \bar{x} = \bar{\bar{x}} - A_2 \bar{R} = 3.013 - (0.58)(0.071) = 2.972$$

$$\text{Upper control limit for } R = D_4 \bar{R} = (2.12)(0.071) = 1.51$$

$$\text{Lower control limit for } R = D_3 \bar{R} = (0)(0.071) = 0$$

Table : 5

Record of number of defectives and calculated fraction defective in daily samples of n = 200

Production Day	Number of Defectives	Fraction Defective	Production Day	Number of Defectives	Fraction Defectives
1	10	0.05	14	14	0.07
2	5	0.025	15	4	0.02
3	10	0.05	16	10	0.05
4	12	0.06	17	11	0.055
5	11	0.055	18	11	0.055
6	9	0.045	19	26	0.13
7	22	0.11	20	13	0.065
8	4	0.02	21	10	0.05
9	12	0.06	22	9	0.045
10	24	0.12	23	11	0.055
11	21	0.105	24	12	0.06
12	15	0.075			
13	8	0.04		294	

$$\bar{p} = \frac{294}{24 \times 200} = 0.061$$

$$s_p = \sqrt{\frac{0.061 \times 0.939}{200}} = 0.017$$

$$3s_p = 3 \times 0.017 = 0.051$$

$$\text{UCL} = \bar{p} + 3s_p = 0.061 + 0.051 = 0.112$$

$$\text{LCL} = \bar{p} - 3s_p = 0.061 - 0.051 = 0.010$$