Indian Statistical Institute

B.Stat III Year: 2018 – 2019

Subject : SQC & OR

# **Assignment No.2 Full Marks : 30 Due Date :**

1. Data were obtained from a process that machines cylinder bores in an engine block. The inside diameter of the cylinder bore was measured following the boring operation. Measurements were made to 1/10,000 of an inch. Sample of size *n* = 5 were taken to obtain some data to initiate  and *R* control charts for the process. The samples were taken roughly every half-hour. The sample measurements were all taken on the same cylinder (position-wise) in the block. The results of the first 35 samples are shown in Table1. The actual measurements are of the form 3.5205, 3.5202, 3.5204, and 3.5209 inches, and so on. The table provides only the last three digits in the measurement. Determine the trial control limits for the process.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Table 1: Cylinder Boring Process Data** | | | | | | | |
| **Time** | **Sample** | **1** | **2** | **3** | **4** | **5** | **Remarks** |
| 8:00 AM | 1 | 205 | 202 | 204 | 207 | 205 | Startup of boring station |
| 8:30 AM | 2 | 202 | 196 | 201 | 198 | 202 |  |
| 9:00 AM | 3 | 201 | 202 | 199 | 197 | 196 |  |
| 9:30 AM | 4 | 205 | 203 | 196 | 201 | 197 |  |
| 10:00 AM | 5 | 199 | 196 | 201 | 200 | 195 |  |
| 10:30 AM | 6 | 203 | 198 | 192 | 217 | 196 | Regular operator absent. |
| 11:00 AM | 7 | 202 | 202 | 198 | 203 | 202 |  |
| 11:30 AM | 8 | 197 | 196 | 196 | 200 | 204 |  |
| 12:00 PM | 9 | 199 | 200 | 204 | 196 | 202 |  |
| 12:30 PM | 10 | 202 | 196 | 204 | 195 | 197 |  |
| 1:00 PM | 11 | 205 | 204 | 202 | 208 | 205 | Startup of boring station |
| 1:30 PM | 12 | 200 | 201 | 199 | 200 | 201 |  |
| 2:00 PM | 13 | 205 | 196 | 201 | 197 | 198 |  |
| 2:30 PM | 14 | 202 | 199 | 200 | 198 | 200 |  |
| 3:00 PM | 15 | 200 | 200 | 201 | 205 | 201 |  |
| 3:30 PM | 16 | 201 | 187 | 209 | 202 | 200 | Regular operator absent. |
| 4:00 PM | 17 | 202 | 202 | 204 | 198 | 203 |  |
| 4:30 PM | 18 | 201 | 198 | 204 | 201 | 201 |  |
| 5:00 PM | 19 | 207 | 206 | 194 | 197 | 201 |  |
| 5:30 PM | 20 | 200 | 204 | 198 | 199 | 199 |  |
| 6:00 PM | 21 | 203 | 200 | 204 | 199 | 200 |  |
| 6:30 PM | 22 | 196 | 203 | 197 | 201 | 194 |  |
| 7:00 PM | 23 | 197 | 199 | 203 | 200 | 196 |  |
| 7:30 PM | 24 | 201 | 197 | 196 | 199 | 207 |  |
| 8:00 PM | 25 | 204 | 196 | 201 | 199 | 197 |  |
| 8:30 PM | 26 | 206 | 206 | 199 | 200 | 203 |  |
| 9:00 PM | 27 | 204 | 203 | 199 | 199 | 197 |  |
| 9:30 PM | 28 | 199 | 201 | 201 | 194 | 200 |  |
| 10:00 PM | 29 | 201 | 196 | 197 | 204 | 200 |  |
| 10:30 PM | 30 | 203 | 206 | 201 | 196 | 201 |  |
| 11:00 PM | 31 | 203 | 197 | 199 | 197 | 201 |  |
| 11:30 PM | 32 | 197 | 194 | 199 | 200 | 199 |  |
| 12:00 AM | 33 | 200 | 201 | 200 | 197 | 200 |  |
| 12:30 AM | 34 | 199 | 199 | 201 | 201 | 201 |  |
| 1:00 AM | 35 | 200 | 204 | 197 | 197 | 199 |  |