

**South Dakota School of Mines and Technology**  
**Department of Materials and Metallurgical Engineering**

Met 352

SPC

1. Construct a mean and range control chart for the following data.
  - a) Is the process in control?
  - b) Are the length of any runs suspect? EXPLAIN
  - c) Are the number of runs suspect? EXPLAIN

k	1	2	3	4	$\bar{x}$	R
1	134	145	139	139	139.25	11.00
2	142	147	142	144	143.75	5.00
3	143	132	146	145	141.50	14.00
4	141	140	138	143	140.50	5.00
5	138	139	144	140	140.25	6.00
6	142	145	149	138	143.50	11.00
7	146	142	140	145	143.25	6.00
8	129	147	142	141	139.75	18.00
9	138	145	138	132	138.25	13.00
10	142	141	148	137	142.00	11.00
11	140	146	135	138	139.75	11.00
12	149	141	138	139	141.75	11.00
13	143	138	142	146	142.25	8.00
14	142	138	136	139	138.75	6.00
15	137	139	147	143	141.50	10.00
16	143	142	143	138	141.50	5.00
17	145	142	139	142	142.00	6.00
18	141	137	142	142	140.50	5.00
19	142	136	144	142	141.00	8.00
20	144	139	139	142	<u>141.00</u>	<u>5.00</u>
				Average	141.10	8.75

2. An aluminum forging operation requires billets  $115.10 \pm 3.50$  cm long. You have been making five length measurements per sample group on the output from the cutoff saw and found the grand mean value for the lengths to be 113.23 cm and the average of the ranges is 0.64.
  - a) Determine the control limits for the mean and the range control charts.
  - b) Is the process currently meeting the tolerance limits for a moderately precise operation?
  - c) Is the process capable of meeting the tolerance limits for a high precision operation?