Mansoura University
Faculty of Engineering
Department of Production Engineering and Mechanical Design

Quality Control
PRE 5422

Final May 2013, 4th year at Production Engineering and Mechanical Design Department.

Attempt All Questions. Use graphics as possible. Time: 3 hours.

Marks assigned equally for each question. Total Marks: 95

1) Give a full discussion for:
   a) Variation sources and variation categories.
   b) Objectives of control charts for variables.
   c) Objectives of control charts for attributes.
   d) Relation between control limits and specifications limits.

2) Discuss the procedures for establishing control charts for variables: $(\bar{X}\ \&\ R)$ and $(\bar{X}\ \&\ s)$.

3) Analyze the possibilities of out–of–control conditions.

4) Given the following data, determine the trial control limits for each subgroup and establish the control chart. Assume that any out–of–control points have assignable causes and determine the standard value for the fraction defective for the next period.

Subgroup Number	Number Inspected	Number Defective	Subgroup Number	Number Inspected	Number Defective
1	171	31	15	165	16
2	167	6	16	170	35
3	170	8	17	175	12
4	135	13	18	167	6
5	137	26	19	141	50
6	170	30	20	159	26
7	45	3	21	181	16
8	155	11	22	195	38
9	195	30	23	165	33
10	180	36	34	140	21
11	181	38	25	162	18
12	115	33	26	191	22
13	165	26	27	139	16
14	189	15	28	181	27

5) Solve the previous Question using two methods for minimizing the effect of variable subgroup size. Give comments on your answer.

6) Assuming that a 9: 3: 1 three–class weighting system is used, determine the central line and control limits when $u_{oc} = 0.8$, $u_{oma} = 0.8$, $u_{omi} = 0.8$, and $n = 40$. Also, establish the demerit per unit control chart for the following points; give comments on our answer.

Subgroup	Critical Defects	Major Defects	Minor Defects
1	3	17	155
2	2	14	70
3	7	22	100
4	2	26	160
5	9	14	123
6	9	23	140
7	6	33	90
8	4	31	138
9	5	17	89
10	8	19	175

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Best Wishes