Reg.No.									

INTERNATIONAL CENTRE FOR APPLIED SCIENCES

(Manipal University)

III SEMESTER B.S. DEGREE EXAMINATION – NOV. / DEC. 2016

SUBJECT: STATISTICAL QUALITY CONTROL (IE 231)

(BRANCH: IP)

Friday, 25 November 2016

Time: 3 Hours **Max. Marks: 100**

- ✓ **Answer ANY FIVE full Questions.**
- ✓ **Missing data, if any, may be suitably assumed.**
- ✓ **Use of SQC tables permitted.**

1 A. A component was tested for many times. On each testing a frequency distribution of the Characteristics values is given in the table.

Characteristics values	Number of times
0-49.99	78
50-99.99	123
100-149.99	187
150-199.99	82
200-249.99	51
250-299.99	47
300-349.99	13
350-399.99	9
400-449.99	6
450-499.99	4

Calculate the mean, median, mode and standard deviation for the above table.

1 B. Distinguish between random causes and assignable causes in SQC.

1 C. What are the benefits of statistical quality control?

[10+5+5=20]

2 A. What is meant by process capability?

2 B. Explain the characteristics of OC curve.

2 C. A single sampling plan is given as N = 10,000, n = 100 and c = 2. compute the approximate probability of acceptance of lots with 1% defective (use Poisson).

[6+6+8= 20]

3 A. How do you compare p chart with X bar and R chart?

3 B. The following are the inspection results of 20 lots magnets, each lot being of 750 magnets. Number of defective magnets in each lot are:

48	56	47	71
83	48	50	53
70	67	47	34
85	37	57	29
45	52	51	30

Calculate the average fraction defective and three sigma control limits for p chart and state whether the process is in control.

3 C. How can you adapt c-chart for quality rating?

[8+6+6= 20]

4 A. Differentiate between AQL and AOQL.

4 B. Justify the 3σ limits as control limits in any control chart.

4 C. What are the types of controls suitable for transmitting discrete information and continuous information?

[6+8+6= 20]

5 A. Explain the concept of Quality costs.

5 B. Explain the characteristics of Hypergeometric Probability Distribution.

5 C. Samples of 20 pieces each are drawn at random from very large lots of components. Determine the probability that such a sample will contains: (a) More than one defective (b) Less than 2 defectives (c) Less than or equal to 2 defectives (d) Utmost 2 defectives (e) At least 2 defective and (f) Exactly 2 defectives. The lot is 20% defective. Use the method that gives theoretically correct results.

[5+5+10= 20]

6 A. Suppose that Noise King is using rectified inspection for its single sampling plan. Calculate the average outgoing quality limit for a plan with n=110, c=3, and N=1000. (Assume that the defective items are replaced).

Proportion Defective		Proportion Defective		Proportion Defective		Proportion Defective		Proportion Defective		Proportion Defective	
(p)	**np**	**(p)**	**np**	**(p)**	**np**	**(p)**	**np**	**(p)**	**np**	**(p)**	**np**
0.005	0.55	0.115	12.65	0.225	24.75	0.335	36.85	0.445	48.95	0.555	61.05
0.01	1.1	0.12	13.2	0.23	25.3	0.34	37.4	0.45	49.5	0.56	61.6
0.015	1.65	0.125	13.75	0.235	25.85	0.345	37.95	0.455	50.05	0.565	62.15
0.02	2.2	0.13	14.3	0.24	26.4	0.35	38.5	0.46	50.6	0.57	62.7
0.025	2.75	0.135	14.85	0.245	26.95	0.355	39.05	0.465	51.15	0.575	63.25
0.03	3.3	0.14	15.4	0.25	27.5	0.36	39.6	0.47	51.7	0.58	63.8
0.035	3.85	0.145	15.95	0.255	28.05	0.365	40.15	0.475	52.25	0.585	64.35
0.04	4.4	0.15	16.5	0.26	28.6	0.37	40.7	0.48	52.8	0.59	64.9
0.045	4.95	0.155	17.05	0.265	29.15	0.375	41.25	0.485	53.35	0.595	65.45
0.05	5.5	0.16	17.6	0.27	29.7	0.38	41.8	0.49	53.9	0.6	66
0.055	6.05	0.165	18.15	0.275	30.25	0.385	42.35	0.495	54.45	0.605	66.55
0.06	6.6	0.17	18.7	0.28	30.8	0.39	42.9	0.5	55	0.61	67.1
0.065	7.15	0.175	19.25	0.285	31.35	0.395	43.45	0.505	55.55	0.615	67.65
0.07	7.7	0.18	19.8	0.29	31.9	0.4	44	0.51	56.1	0.62	68.2
0.075	8.25	0.185	20.35	0.295	32.45	0.405	44.55	0.515	56.65	0.625	68.75
0.08	8.8	0.19	20.9	0.3	33	0.41	45.1	0.52	57.2	0.63	69.3
0.085	9.35	0.195	21.45	0.305	33.55	0.415	45.65	0.525	57.75	0.635	69.85
0.09	9.9	0.2	22	0.31	34.1	0.42	46.2	0.53	58.3	0.64	70.4
0.095	10.45	0.205	22.55	0.315	34.65	0.425	46.75	0.535	58.85	0.645	70.95
0.1	11	0.21	23.1	0.32	35.2	0.43	47.3	0.54	59.4		
0.105	11.55	0.215	23.65	0.325	35.75	0.435	47.85	0.545	59.95		
0.11	12.1	0.22	24.2	0.33	36.3	0.44	48.4	0.55	60.5		

6 B Data for defects on TV set from 20 samples (sample size = 10) are shown in the table below. Draw a c-chart with suitable assumption.

Sample No.	No. of Defects	Sample No.	No. of Defects	Sample No.	No. of Defects	Sample No.	No. of Defects
1	5	6	4	11	6	16	5
2	4	7	5	12	5	17	4
3	5	8	6	13	4	18	6
4	6	9	8	14	7	19	6
5	4	10	7	15	6	20	6

6 C. Explain the tables for Dodge- Roaming acceptance sampling method

[8+8+4= 20]

7 A. How will you classify defects?

7 B. What are the basic elements of reliability?

7 C. Write short notes on
a) Quality circle
b) Fishbone diagram
c) Pareto chart

[5+3+12= 20]

8 A. An effective life of a certain type of small motor is 10 years with a variance of 4 years. Manufacturer replaces free all motors that fails under the above guarantee period. If the supplier is willing to replace only 5% of the motors that fail, how long a guarantee should be offered? Assume life of motor follow normal distribution.

8 B. Control charts for X bar and R are maintained on a certain dimension of a manufactured part which is specified as 2.05 ± 0.02 cms. Subgroup size is 4. The values of X bar and R are computed for each subgroup. After 20 subgroups, $\sum \bar{x} = 41.283$ and $\Sigma R = 0.280$. If the dimensions fall above USL, rework is required, if below LSL, the part must be scrapped. If the process is in statistical control and normally distributed,
(a) Determine the 3σ control limit for X double bar and R bar chart.
(b) What is process capability.
(c) What can you conclude regarding its ability to meet specifications.
(d) Determine the percentage of scrap and rework.
(e) What are your suggestions for improvement.

8 C. Write a short note on Item-by-Item Sequential Sampling.

[8+8+4= 20]