BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(MID SEMESTER EXAMINATION)

CLASS: BE **SEMESTER: V**
BRANCH: PROD. **SESSION : MO/2018**

SUBJECT : PE5005 STATISTICAL QUALITY CONTROL

TIME: 1.5 HOURS **FULL MARKS: 25**

INSTRUCTIONS:
1. The total marks of the questions are 30.
2. Candidates may attempt for all 30 marks.
3. In those cases where the marks obtained exceed 25 marks, the excess will be ignored.
4. Before attempting the question paper, be sure that you have got the correct question paper.
5. The missing data, if any, may be assumed suitably.
6. Cumulative Poisson distribution table can be used.

Q1 (a) With the help of neat diagram explain the optimal level of total quality cost [2]
(b) Define quality of design and quality of conformance? Explain the factors which influences the quality of design. [3]

Q2 (a) At an outpatient testing center, the number of cardiograms performed each day for 20 days is shown. Construct a stem and leaf plot for the data. [2]

25	31	20	32	13
14	43	2	57	23
36	32	33	32	44
32	52	44	51	45

(b) What do you understand by dispersion? Discuss the relative merits of various measures of dispersion. [3]

Q3 (a) Explain any five rules that indicates the presence of assignable variation in a Control Chart? [2]
(b) A quality control inspector at soft drink company has taken ten samples with four observations each of the volume of bottles filled. The data and the computed means are shown in the table. If the standard deviation of the bottling operation is 0.14 ounces, develop control limits of 3σ of X bar chart for the bottling operation. Also calculate the control limits of R-chart. For n=4: B3=0, B4=2.266, D1=0, D2=4.698, D3=0, D4=2.28 [3]

Sample	x1	x2	x3	x4
1	11.9	11.92	12.09	11.91
2	12.03	12.03	11.92	11.97
3	11.92	12.02	11.93	12.01
4	11.96	12.06	12	11.91
5	11.95	12.1	12.03	12.07
6	11.99	11.98	11.94	12.06
7	12	12.04	11.92	12
8	12.02	12.06	11.94	12.07
9	12.01	12.06	11.94	11.91
10	11.92	12.05	11.92	12.09

Q4 (a) Three bagging machines at the Crunchy Potato Chip Company are being evaluated for their capability. The following data are recorded [2]

Machine	A	B	C
σ	0.2	0.3	0.05

If specifications are set between 12.35 and 12.65 ounces, determine which of the machines are capable of producing within specification.

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(b) A production manager at a light bulb plant has inspected the number of defective light bulbs in 10 random samples with 30 observations each. Following are the numbers of defective light bulbs found: [3]

Sample no.	1	2	3	4	5	6	7	8	9	10
No. of defectives	1	3	3	1	0	5	1	1	1	1

Construct a three-sigma control chart (z = 3) with this information.

Q5 (a) What is acceptance sampling? Discuss the situations in which acceptance sampling is useful. [2]

(b) What is an OC curve? Discuss the salient features of the types of OC curves. Discuss the conditions under which poisson approximation of probability of acceptance (Pa) can be used for different types of OC curves. [3]

Q6 (a) Construct the AOQ curve for the sampling plan N = 2000, n = 50, c = 2. Find the average outgoing quality limit (AOQL). [5]

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Table 1: Cumulative Poisson Probabilities

λ=np

x	0.01	0.1	0.5	1	1.5	2	2.5	3
0	0.995	0.9048	0.6065	0.3679	0.2231	0.1353	0.0821	0.0498
1	1	0.9953	0.9098	0.7358	0.5578	0.406	0.2873	0.1991
2	1	0.9998	0.9856	0.9197	0.8088	0.6767	0.5438	0.4232
3	1	1	0.9982	0.981	0.9344	0.8571	0.7576	0.6472

x	3.5	4	4.5	5	6.5	7	7.5	8
0	0.0302	0.0183	0.0111	0.0067	0.0015	0.0009	0.0006	0.0003
1	0.1359	0.0916	0.0611	0.0404	0.0113	0.0073	0.0047	0.003
2	0.3208	0.2381	0.1736	0.1247	0.043	0.0296	0.0203	0.0138
3	0.5366	0.4335	0.3423	0.265	0.1118	0.0818	0.0591	0.0424