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Register Number: **7325**

Name of the Candidate:

DIPLOMA EXAMINATION - 2010

(QUALITY MANAGEMENT)

(PAPER – III)

130. STATISTICAL PROCESS CONTROL

December) (*Time: 3 Hours*

Maximum: 100 Marks

Answer any FIVE questions.
Use of Statistical Table is permitted.
All questions carry equal marks. (5 × 20 = 100)

UNIT – I

1. (a) What is SQC? Explain the objectives and the advantages of it. (10)

   (b) Explain the causes of variation in quality of manufactured product. (10)

(OR)

2. (a) Explain how statistics can be used for controlling the quality product with an example. (10)

   (b) What are types of inspection? Discuss the features and their relative merits and demerits. (10)

UNIT – II

3. (a) What is C-chart? State and discuss the approximation in determining the control and warning limits for a c-chart. (10)

   (b) Ten samples of (100 m length) were examined and the defects were found as listed below: (10)

Item No	1	2	3	4	5	6	7	8	9	10
No of defectives	3	2	1	0	4	2	4	4	1	2

Prepare a control chart showing the action limits and warning limits. Does

this chart really need to lower the action and warning limits?

(OR)

4. (a) Distinguish between p-chart and c-chart; discuss some situations in which c-chart is most appropriate. (10)

(b) The following table gives the number missing rivets noted on an aircraft body during preventive maintenance inspection:

Aircraft No	Number of missing rivets
1	8
2	15
3	15
4	19
5	9
6	15
7	9
8	12
9	21
10	13
11	21
12	16
13	9
14	23
15	15

Compute the control limits and plot the C-chart. Comment on the state of control. (10)

UNIT – III

5. (a) The mean cantilever strength of cast resin port insulators of 11 Ky type A From a controlled manufacturing process from 20 subgroup of size 3 was found in control chart analysis to be 580 kg. The mean range was 8 kg. If $\overline{X}$-R charts are maintained.

(i) What is the probability that a fall in the mean strength to 575 kg is detected by the $\overline{X}$-chart.

(ii) If the $\overline{X}$ -R charts are maintained with an increased subgroup size of 6, what is the probability that a fall in the mean strength of 575 kg is detected by $\overline{X}$-chart. (10)

(b) Explain the salient features of Mean $\overline{X}$ Chart and standard deviation 'σ' Chart. (10)

(OR)

6. (a) What are the various types of control charts for variable used in production? (5)

(b) The argon gas pressure in four feet fluorescent lamp tube was to be controlled to ensure the correct wattage of the bulbs. Control charts are to be initiated to monitor argon gas. Pressure by sampling in a subgroup size of 3.the following data is collected.

Sample No	Mean $\overline{X}$	Range R	Sample No	Mean $\overline{X}$	Range R
1	2.1	0.25	11	2.7	0.2
2	2.55	0.3	12	2.8	0.25
3	2.65	0.1	13	2.6	0.3
4	2.75	0.2	14	2.5	0.1
5	2.70	0.2	15	2.8	0.2
6	2.90	0.3	16	3.0	0.4
7	2.50	0.25	17	2.8	0.3
8	2.50	0.0	18	2.5	0.15
9	2.0	0.2	19	3.4	0.2
10	2.8	0.3	20	1.96	0.2

Construct the control chart for mean and range and comment on the state of control. (15)

UNIT – IV

7. (a) Explain how process capability indexes measure the performance. (10)

(b) A certain product has been statically controlled at a process average of 36.0 and a standard deviation of 1.00. The product is supplied to two customers who have their own specifications. The customer A sets a specification of 40.0 ± 4.0 and the customer B sets a specification of 38.0 ± 4.0.

(i) Based on the conditions what percentage of the product produced will not meet the specification requirements of customer A & Customer B.

(ii) Assuming that the two users needs were equal, a suggestion to shift the target to 39.0. At this suggested value what percentage of the product produced will not meet the requirements of customer A & Customer B? (10)

(OR)

8. (a) A certain manufacturing process has been operating in control at a mean of 75.00 mm with upper control limits on mean chart is 75.225 and 74. 775, respectively. The process standard deviation is 0.15 mm, and the specifications on the dimension are 75.0 ± 0.50 mm. For the sub group size of 5, calculate the process capability indexes for this process. (10)

(b) What are the Statistical control limits and specification limits? Discuss the relationship between them. (10)

UNIT – V

9. (a) Write short notes on:
   (i) Group control chart and
   (ii) Slopping control chart. (10)

   (b) Write short notes on:
   (i) Coefficient of variation control chart and
   (ii) Cumulative sum control chart. (10)

(OR)

10. (a) What are special control charts? Discuss the significance of each chart. (5)

    (b) The daily analysis of CO_2 as CaO at an intermediate stage in a chemical manufacturing process is listed below:

Date	Percent CO_2 as CaO	Date	Percent CO_2 as CaO	Date	Percent CO_2 as CaO
May 1	0.53	May 17	0.69	June 1	0.67
2	0.62	18	0.65	2	0.68
3	0.63	19	0.65	3	0.72
4	0.54	20	0.67	4	0.70
5	0.50	21	0.71	5	0.67
6	0.50	22	0.78	6	0.69
7	0.51	23	0.82	7	0.68
8	0.53	24	0.82		
9	0.56	25	0.88		
10	0.64	26	0.82		
11	0.57	27	0.71		
12	0.56	28	0.68		
13	0.55	29	0.74		
14	0.65	30	0.66		
15	0.59	31	0.67		
16	0.60				

Compute the 3-day moving averages and moving ranges for these data, and Establish $\overline{X}$ and R control limits for monitoring the process based on the control limits on a standard process average of 0.660 and $\overline{R}$ of 0.075. (15)

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