

CBCS Scheme

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15MA64

Sixth Semester B.E. Degree Examination, June/July 2018

Statistical Quality Control

Time: 3 hrs.

Max. Marks: 80

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.

2. Use of SQC tables permitted.

Module-1

- 1 a. Define 'Quality'. List and explain the 5 basic quality characteristics. (06 Marks)
b. Distinguish between 'Quality of Design' and 'Quality of Conformance'. What factors influence them? (10 Marks)

OR

- 2 a. Distinguish clearly between 'Cost of Quality' and 'Value of Quality'. How do you balance them? (10 Marks)
b. Compare inspection, quality control, and quality assurance. (06 Marks)

Module-2

- 3 a. Differentiate between 'Chance Causes' and 'Assignable Causes' of variation, with examples. (05 Marks)
b. Control chart for \bar{X} and range maintained for a parameter in SQC programme. The subgroup size is four. The values of \bar{X} and R after 10 subgroups are tabulated below :

Subgroup no. →	1	2	3	4	5	6	7	8	9	10
'X' bar →	20.25	22.01	21.90	20.88	21.05	21.25	21.09	22.00	20.98	21.00
Range →	1.50	0.85	1.15	1.45	0.95	0.99	0.89	0.97	1.25	1.00

Construct X-bar and range charts and comment on the status of control. What is your suggestion for future? (11 Marks)

OR

- 4 a. Distinguish clearly between 'Variables' and 'Attributes' giving examples. (05 Marks)
b. The number of defects recorded for 10 lots of production of a component are given below. Construct an appropriate control chart using average lot size and give your suggestion for future production.

Lot no. →	1	2	3	4	5	6	7	8	9	10
Units →	46	43	49	45	45	47	44	46	45	42
Defects	118	96	125	87	99	123	104	123	112	98

(11 Marks)

Module-3

- 5 a. What are warning limits on control charts? Explain the construction of control charts with warning limits on it. (08 Marks)
b. What are reject limits on a control chart? With neat sketches show the relationship among specification limits and rejection limits. (08 Marks)

OR

- 6 a. With a neat sketch explain the use of cumulative-sum charts. What are its advantages? (08 Marks)
- b. With a neat sketch explain the construction and use of \bar{X} charts with linear trend. Indicate the common application of these charts. (08 Marks)

Module-4

- 7 a. What is "Process capability"? What are the different methods of estimating it? explain briefly. (08 Marks)
- b. A sample of 4 items are taken from a manufacturing process at regular intervals. 'X' and 'R' values are computed for each sample and after 25 samples $\sum \bar{X} = 15350$ and $\sum R = 411.40$. Compute :
- i) Control chart limits for 'X' and 'R' chart.
- ii) Assuming that the process is I statistical control estimate the 'Process Capability'. (08 Marks)

OR

- 8 a. With neat sketches show the possible situations, when 'Specification Tolerance' is greater than, less than, and equal to 'Process Capability'. (06 Marks)
- b. Control chart for 'X' and R are to be maintained for a part which has a specification of $2.05^{+0.02}$ mm. The sample size is 4. The values of $\sum \bar{X}$ and $\sum R$ after 20 subgroups is 41.283mm and 0.28mm respectively. Compute the trial control limits for 'X' and 'R' charts. If the process is in statistical control, what can you tell about the capability of the process to meet the given specifications? How to improve the situation. (10 Marks)

Module-5

- 9 a. Sketch a typical 'OC' curve of an acceptance sampling plan and mark on it : (06 Marks)
- i) AQL ii) RQL iii) IQL iv) PR (α) v) CR (β).
- b. The following are the specifications of a double sampling plan :
 $N = 50,000$; $n_1 = 150$; $C_1 = 0$; $n_2 = 100$; $C_2 = 1$; $p = 1\%$.
 Compute : i) P_a ii) AOQ iii) ASN iv) ATI v) AFI. (10 Marks)

OR

- 10 a. Represent a 'Double Sampling Plan' using a flow chart. (06 Marks)
- b. Draw the OC curve for the following sampling plan : $n = 300$; $C = 5$ consider p' from 0% to 2.4% in steps of 0.2%. What is the AOQL of this plan? (10 Marks)

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