

2021**STATISTICS — HONOURS****Paper : DSE-A-1****(Statistical Quality Control)****Full Marks : 50***The figures in the margin indicate full marks.**Candidates are required to give their answers in their own words as far as practicable.*

1. Answer **any five** questions : 2×5
- (a) What do you mean by quality of a product?
 - (b) What is defect?
 - (c) Illustrate a situation when the upper control limit may be relaxed.
 - (d) When should one use the S -chart instead of an R -chart?
 - (e) What are incoming and outgoing quality?
 - (f) What is meant by AQL?
 - (g) Define ARL.
 - (h) What is process capability index?
2. Answer **any two** questions : 5×2
- (a) Discuss briefly how the patterns on a control chart may be analyzed.
 - (b) What are process and product controls? Illustrate, through an example, why product control may not be achieved even if the process were in control.
 - (c) A producer claims that his products have no more than 1% defectives. One single item from each of his lots of size N is inspected and the lot is accepted or rectified according as the item is non-defective or defective. For this plan find the ATI and AOQ.
3. Answer **any three** questions : 10×3
- (a) Give a brief outline of the utility of seven important tools of statistical process control.
 - (b) Describe the construction of an (\bar{X}, R) chart. Assuming normality, find its OC function and also the ARL. Explain why one should construct the R -chart ahead of the \bar{X} chart.
 - (c) Describe the construction of a fraction defective chart. Also discuss how to deal with the situation when the sample size varies.

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- (d) Two companies X and Y, producing electric bulbs, have two different goals for their products. Company X wants to ensure that the average life of their bulbs is 200 hours while Company Y wants that 80% of their bulbs work for at least 200 hours. Describe in detail how the two companies can ensure that their respective goals are met. State clearly any assumption you make.
 - (e) Describe a double sampling rectification plan when the items are inspected one by one with replacement. Find the expressions of OC and ATI as a function of fraction defective.
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