WEST BENGAL STATE UNIVERSITY

B.Sc. Honours 4th Semester Examination, 2021

STSACOR10T-STATISTICS (CC10)

Time Allotted: 2 Hours | Full Marks: 40

The figures in the margin indicate full marks.
Candidates are required to give their answers in their own words as far as practicable.
All symbols are of usual significance.

Answer any *four* questions from Question Nos. 1-6 and any *two* questions from Question Nos. 7-9

1. Briefly describe the following:
   (a) Producer's value 1
   (b) Producer's risk 1
   (c) Consumer's value 1
   (d) Consumer's risk 1
   (e) Average outgoing quality limit (AOQL). 1

2. Illustrating through examples, distinguish between process control and product control. Which of the two would you prefer (i) as a customer and (ii) as a producer? 5

3. A 3σ control chart for the mean is set up for a quality characteristic which follows a normal distribution with mean μ and known variance σ^2. The specified value of μ is μ_0. Find an expression for the probability that of the subsequent 4 subsamples, at least 3 would be out of control if the variance of the process is doubled. 5

4. You are provided with the means and the standard deviations of diameters of n cylinders manufactured and collected from each of m machines in a factory. How can you utilize these data to comment on the state of control of the manufacturing process? 5

5. All points on a certain control chart are found to be within the control band. Does it always mean that the process is in state of control? Explain your answer. 5

6. Briefly describe the DMAIC phases in the context of Six Sigma. 5

7. For a very large lot of size $N = 1000$, a double inspection acceptance rectification plan is designed as follows: 2+2+(2+2)+2

First inspect $n_1 = 5$ items. Accept the lot if the number of defectives $x_1 = 0$ or 1 and reject if $x_1 = 4$ or 5. If $x_1 = 2$ or 3, draw a second sample of size $n_2 = 2$ and accept the lot if the number of defectives $x_2 = 0$, rejecting it otherwise. Find the

(i) Producer's risk for a process average of 0.1.

(ii) The consumer's risk for LTPD 20%.

(iii) The AOQ for fraction defectives 0.1 and 0.2.

(iv) ASN for fraction defective 0.2.

8. (a) Distinguish between tolerance and specification limits. 2

(b) If the variability of a quality characteristic (continuous) is σ^2 and USL and LSL are given for the mean μ, discuss the implications and the corresponding actions necessary for each of the cases 3

(i) USL – LSL $< 6\sigma$

(ii) USL – LSL $> 6\sigma$.

(c) For case (ii), discuss how a modified control chart can be set up. 5

9. A control chart is set up to check whether a particular brand of mobile phones is defective or not.

(a) What practical difficulties will arise if the sub-sample sizes vary as $n = 3, 4$ or 5? 2

(b) To circumvent the difficulty in (a), two alternatives are thought of: use fix sample size charts either (i) with $n = 3$ or (ii) with $n = 5$. Discuss, with reasons, the one you would prefer from quality and cost points of view. 4

(c) Suggest a better solution to ensure quality without increasing cost too much. 4

N.B. : *Students have to complete submission of their Answer Scripts through E-mail / Whatsapp to their own respective colleges on the same day / date of examination within 1 hour after end of exam. University / College authorities will not be held responsible for wrong submission (at in proper address). Students are strongly advised not to submit multiple copies of the same answer script.*

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