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Total No. to be printed: 02

[24] SEAT No. _____

Sardar Patel University
 Department of Statistics
External Examination, March -2019
M.Sc. (Applied Statistics) , Semester II
PS02CAST23: Statistical Quality Control and Reliability
March 18, 2019 Monday

Time: 10:00 AM – 01:00PM

Total Marks:70

Note: For subgroup size 6 the constant values are

$A=1.22, A_1=1.41, A_2=0.48, D_3=0, D_4=2, d_2=2.534, B_3=0.03, B_4=1.97, B_1=0.03, B_2=1.71$

Q.1) Multiple choice questions.

[08]

- 1) For control chart based on non-conformities per unit, underline distribution assumed is ...
 a) Poisson b) Binomial c) Geometric d) Normal
- 2) The probability of accepting the lot if $n=10$ with fraction defective 2×10^{-2} with lot of size 100 and acceptance number 1 is ...
 a) 0.9016 b) 0.8325 c) 0.9895 d) 0.9620
- 3) The points falling outside the control limits and within specification limit shows
 I. Assignable cause present III . Cp is less than 1
 II. Cp is greater than 1 IV. Chance causes present
 a) Both (I) and (II) True c) Only (II) false
 b) Both (I) and (IV) True d) Both (I) and (III) True
- 4) Cost associated with auditing the product come under ... Quality Cost.
 a) Prevention b) Appraisal c) Internal d) External
- 5) The probability that a point will fall outside the control limits in \bar{X} – chart is When only chance cause of variation present in the process.
 a) 0.9473 b) 0.0027 c) 0.0270 d) 0.0527
- 6) The Dodge-Roming tables are applicable for the lot size
 a) 1 to 100000 b) 1 to 10000 c) 10 to 1000 d) None of the above
- 7) The time required to perform maintenance action is called as
 a) MTBF b) MTTR c) MTTF d) None of above
- 8) For varying subgroup size Control chart is applicable.
 a) p-chart b) S-chart c) np-chart d) both (a) and (b)

Q.2) Answer any seven.

[14]

- a) Give classification of quality characteristics with suitable example.
- b) Draw neat and labeled ideal OC curve. Discuss in brief.
- c) Write meaning of notation $(1, \bar{X})$ and $(0i, \bar{X})$ where $\bar{X} = (X_1, X_2, \dots, X_n)$.
- d) Define ARL and ATS.

①

(P.T.O)

- e) Hazard rate of exponential distribution is depending time. Justify the sentence.
- f) Discuss reliability block diagram.
- g) Distinguish between chance and assignable causes of variation.
- h) Write control limits for the non conformities per unit.
- i) Write two advantages and disadvantages of 100% inspection and sampling inspection.

- Q.3)a) Discuss 14 points of Deming's quality management philosophy. [06]
 b) Explain in detail quality cost. [06]

==OR==

- b) Explain in dimensions of quality. [06]

- Q.4)a) Write a short note on, [06]
 a) Failure rate curve
 b) IFR and DFR

- b) Write a note on hazard rate. Compute hazard rate for the Weibull and Raleigh Distribution. [06]

==OR==

- b) Write a note on reliability function. Given the following pdf for r.v. T, the time to failure of a compressor, what is the reliability for a 100 hrs operating life? [06]

$$f(t) = \begin{cases} 0.001 (1 + 0.001 t)^{-2} & ; t \geq 0 \\ 0 & ; o.w \end{cases}$$

- Q.5)a) Discuss in detail capability analysis for the centered and off centered process. [06]
 In a capability study of lathe used in turning a shaft to a diameter of 23.75 ± 0.1 mm a sample of 6 consecutive pieces was taken each day for 8 days. Mean of 8 subgroup range is 0.0675; mean of 8 subgroups is 23.765. Compute process capability ratio.

- b) Discuss in detail construction of $\bar{X} - R$ chart. [06]

==OR==

- b) Discuss in detail construction of $\bar{X} - S$ chart. [06]

- Q.6)a) Explain in detail OC function and curve. [06]

- b) Discuss single, double sampling plan. [06]

For a single sampling plan, a lot contain twenty defective out of 1000 items. Find the probability of accepting the lot if $N=100$, $n=10$ and $c=1$.

==OR==

- b) Discuss sequential sampling in detail. [06]

