

Paper ID/Code

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**M. A./M. Sc. (Final) EXAMINATION, 2021**

(Old &amp; New Course)

STATISTICS

Paper Third

(Sampling Theory &amp; Statistical Quality Control)

Time : 1 : 30 Hours ]

[ Maximum Marks : 100

जब तक कहा न जाए, इस प्रश्न पुस्तिका को न खोलें

निर्देश :

1. परीक्षार्थी अपने अनुक्रमांक, विषय एवं प्रश्नपुस्तिका की सीरीज का विवरण यथास्थान सही-सही भरें, अन्यथा मूल्यांकन में किसी भी विसंगति की दशा में उसकी जिम्मेदारी स्वयं परीक्षार्थी की होगी।
2. इस प्रश्नपुस्तिका में 60 प्रश्न हैं जिनमें से केवल 50 प्रश्नों के उत्तर परीक्षार्थियों द्वारा दिये जाने हैं। प्रत्येक प्रश्न के चार वैकल्पिक उत्तर प्रश्न के नीचे दिये गये हैं। इन चारों में से केवल एक ही उत्तर सही है। जिस उत्तर को आप सही या सबसे उचित समझते हैं, अपने उत्तर पत्रक (O.M.R. ANSWER SHEET) में उसके अक्षर वाले वृत्त को काले या नीले बाल फ्लाइंट पेन से पूरा भर दें। यदि किसी परीक्षार्थी द्वारा निर्धारित प्रश्नों से अधिक प्रश्नों के उत्तर दिये जाते हैं तो उसके द्वारा हल किये गये प्रथमतः यथानिर्दिष्ट प्रश्नोत्तरों का ही मूल्यांकन किया जायेगा।
3. प्रत्येक प्रश्न के अंक समान हैं। आपके जितने उत्तर सही होंगे, उन्हीं के अनुसार अंक प्रदान किये जायेंगे।
4. सभी उत्तर केवल ओ0 एम0 आर0 उत्तर पत्रक (O.M.R. ANSWER SHEET) पर ही दिये जाने हैं। उत्तर पत्रक में निर्धारित स्थान के अलावा अन्यत्र कहीं पर दिया गया उत्तर मान्य नहीं होगा।
5. ओ0 एम0 आर0 उत्तर पत्रक (O.M.R. ANSWER SHEET) पर कुछ भी लिखने से पूर्व उसमें दिये गये सभी अनुदेशों को सावधानीपूर्वक पढ़ लिया जाये।
6. परीक्षा समाप्ति के उपरान्त परीक्षार्थी कक्ष निरीक्षक को अपनी प्रश्नपुस्तिका बुकलेट एवं ओ0 एम0 आर0 शीट पृथक्-पृथक् उपलब्ध कराने के बाद ही परीक्षा कक्ष से प्रस्थान करें।

**महत्वपूर्ण :** प्रश्नपुस्तिका खोलने पर प्रथमतः जाँच कर देख लें कि प्रश्नपुस्तिका के सभी पृष्ठ भलीभाँति छपे हुए हैं। यदि प्रश्नपुस्तिका में कोई कमी हो, तो कक्ष निरीक्षक को दिखाकर उसी सीरीज की दूसरी प्रश्नपुस्तिका प्राप्त कर लें।

1. Quality is "fitness for use", this definition was given by :
  - (A) Juran
  - (B) Deming
  - (C) Taguchi
  - (D) DuPont
2. The one which is not an assignable cause of variation from the given list :
  - (A) Negligence of operators
  - (B) Faulty equipment
  - (C) Defective raw material
  - (D) Voltage fluctuations
3. Quality is "Conformance to requirements", it was mentioned by :
  - (A) Walter A. Shewhart
  - (B) Taguchi
  - (C) Crosby
  - (D) Deming
4. Which of the following includes in cost of quality ?
  - (A) Cost of appraisal
  - (B) Cost of prevention
  - (C) Cost of failure
  - (D) All of the above
5. To examine the number of imperfections in a bale of cloth the following control chart is useful :
  - (A) X bar-chart
  - (B) R-chart
  - (C)  $p$ -chart
  - (D)  $c$ -chart
6. During the examination of the control charts, the following indicates the lack of statistical control :
  - (A) Point outside the control limits
  - (B) Run of seven or more points
  - (C) Sample points too close to the central line
  - (D) All of the above
7. Which of the following control chart types would be used to monitor the average weight of the contents of a box of cereal ?
  - (A) X bar-chart
  - (B) R-chart
  - (C)  $p$ -chart
  - (D)  $c$ -chart
8. Which of the following chart types would be used to monitor the fraction of a production lot of desktops that had scratches on the surface ?
  - (A) X bar-chart
  - (B) R-chart
  - (C)  $p$ -chart
  - (D)  $c$ -chart
9. The advantages of statistical quality control include :
  - (A) Enhanced customer satisfaction
  - (B) Reduction in operating costs
  - (C) Reduction in scrap
  - (D) All of the above
10. The concept of control chart to adjudge the quality of goods statistically was given by :
  - (A) Walter A. Shewhart
  - (B) Deming
  - (C) Taguchi
  - (D) DuPont

11. The following applied the statistical theory to sampling inspection and contributed in the development of Sampling Inspection Tables :
- H. F. Dodge and H. C. Romig
  - Deming
  - Shewhart
  - DuPont
12. The control charts are used for :
- Product control
  - Process control
  - Both (A) and (B)
  - None of the above
13. Sampling Inspection Plans aims to :
- control the quality of the product by critical examination at strategic points.
  - ensure that the production process is maintaining a satisfactory level of the manufactured product.
  - ensure that process is not operating under chance causes.
  - None of the above
14. The maximum and minimum limits of variation of the individual items as mentioned in the product design are called :
- Specification limits
  - Control limits
  - Tolerance limits
  - $3\sigma$  limits
15. Process Capability Ratio (PCR) is defined as the ratio :
- Difference between Natural Tolerance Limit/Specification Limits
  - Difference between Specification Limits/ $6\sigma$
  - Difference between Control Limits/ $6\sigma$
  - $6\sigma$ /Difference between Control Limits
16. Average Sample Number (ASN) for a Double Sampling Plan in usual notations, is given as :
- $n_1 + [n_2(1 - P_1)]$
  - $[n_1(1 - P_1)] + n_2$
  - $n_1(1 - P_1) + n_2(1 - P_1)$
  - None of the above
17. In a Single Sampling Inspection Plan, the probability of obtaining exactly  $x$  defectives in the sample of size  $n$  from a lot size  $N$  follows :
- Binomial Distribution
  - Poisson Distribution
  - Hyper-Geometric Distribution
  - Normal Distribution
18. Double Sampling Plan is better than Single Sampling Plan :
- Simple, easy to administer
  - Average less amount of inspection
  - Have greater discriminatory power
  - Both (B) and (C)
19.  $p$ -charts are based on the :
- Normal distribution.
  - Poisson distribution.
  - Binomial distribution.
  - Negative exponential distribution.

20. Natural variations are the several sources of variation within a process that :
- (A) are not perfect
  - (B) have several assignable causes of variation
  - (C) cannot be ascertained by the investigator
  - (D) are in statistical control
21. OC-Curve is an acronym for :
- (A) Operating Characteristic Curve
  - (B) Optimum Characteristic Curve
  - (C) Optimum Control Curve
  - (D) Operational Control Curve
22. Control charts are used to monitor :
- (A) Random variation
  - (B) Assignable variation
  - (C) Both (A) and (B)
  - (D) None of the above
23. CUSUM charts are useful for :
- (A) Detecting small process shifts
  - (B) Monitor cost variations
  - (C) Monitoring customer response
  - (D) None of the above
24. In acceptance sampling, when there is a finite probability that the lot may be rejected even if the quality is actually good, it is called :
- (A) Consumer's risk
  - (B) Producer's risk
  - (C) Operator's risk
  - (D) None of the above
25. In double sampling plan, if the numbers of defects is in between the two cut-off numbers  $C_1$  and  $C_2$ , then :
- (A) Accept the lot
  - (B) Reject the lot
  - (C) Take another sample
  - (D) None of the above
26. In sequential sampling plan :
- (A) Maximum 02 samples are taken
  - (B) Maximum 03 samples are taken
  - (C) Maximum 04 samples are taken
  - (D) Samples are accumulated at each stage till the decision of accepting or rejecting a lot is taken
27. The LTPD represents :
- (A) The level of quality that will be accepted 95 percent of the time.
  - (B) The level of quality routinely rejected by the sampling plan
  - (C) The quality level that is the worst tolerable
  - (D) None of the above
28. The shape of the ASN curve for a single sampling plan is :
- (A) Parabola
  - (B) Straight line
  - (C) Exponential
  - (D) Cannot be determined in advance
29. ARL (Average Run Length) is :
- (A) The expected number of subgroups until a control chart first signals
  - (B) The average value of runs observed in control chart
  - (C) Average number of samples with runs
  - (D) None of the above

30. Sample Survey relies on the following principle :
- Principle of Statistical Regularity
  - Principle of Inertia of Large Numbers
  - Both (A) and (B)
  - None of the above
31. Quota sampling is the combination of ..... and ..... sampling schemes.
- Purposive and Deliberate
  - Purposive and Systematic
  - Stratified and Systematic
  - Purposive and Stratified
32. Among the following sampling methods, which is a probability method of sampling ?
- Quota
  - Judgement
  - Simple random
  - Convenience
33. Which among the following is the benefit of using simple random sampling ?
- The results are always representative.
  - Interviewers can choose respondents freely.
  - Informants can refuse to participate.
  - One can calculate the accuracy of the results.
34. The probability of selecting a sample containing  $n$  items from a population with  $N$  items without replacement is :
- $1/N C_n$
  - $1/n C_N$
  - $1/2n$
  - $1/2N$
35. Increasing the sample size has the following effect upon the sampling error :
- It increases the sampling error
  - It reduces the sampling error
  - It has no effect on the sampling error
  - Cannot be determined
36. Which of the following is not a type of non-probability sampling ?
- Quota sampling
  - Convenience sampling
  - Snowball sampling
  - Stratified random sampling
37. Sample is regarded as a subset of :
- Data
  - Set
  - Distribution
  - Population
38. Selection of a football team for World Cup requires :
- random sampling
  - systematic sampling
  - purposive sampling
  - cluster sampling
39. The difference between a statistic and the parameter is called :
- Non-random error
  - Probability error
  - Sampling error
  - Random variation
40. The probability of selecting an item in probability sampling, from the population of size  $N$  is known and is :
- Equal to one
  - Equal to zero
  - $2/N$
  - $1/N$

41. The distribution that is formed by all possible values of a statistic is known as :
- Hypergeometric distribution
  - Normal distribution
  - Sampling distribution
  - Binomial distribution
42. The standard deviation of the sampling distribution of any statistic is called :
- Type-I Error
  - Non-Sampling Error
  - Standard Deviation
  - Standard Error
43. Sampling is better than census as it :
- Allows estimation of error
  - Requires fewer units
  - Enables estimation in destructive processes
  - All of the above
44. The difference between the expected value of a statistic and the value of the parameter being estimated is called :
- Standard error
  - Bias
  - Sampling error
  - Non-sampling error
45. What does the central limit theorem state ?
- if the sample size increases sampling distribution must approach normal distribution
  - if the sample size decreases then the sample distribution must approach normal distribution
  - if the sample size increases then the sampling distribution much approach an exponential distribution
  - if the sample size decreases then the sampling distribution much approach an exponential distribution
46. The list of all units in a population is called :
- Random sampling
  - Sampling frame
  - Bias
  - Parameter
47. Any numerical value calculated from sample data is called :
- Error
  - Statistic
  - Bias
  - Mean
48. Standard Error is :
- Always positive
  - Always negative
  - Can be either positive or negative
  - Always zero
49. To make a voters list for the upcoming general elections then one requires :
- sampling error
  - random error
  - census
  - simple error
50. Sampling error is reduced by :
- Increasing Sample Size
  - Decreasing Sample Size
  - Reducing the Amount of Data
  - None of the above

51. Cluster Sampling technique constitutes composition of :
- (A) Homogeneous subgroups in population
  - (B) Heterogeneous subgroups in population
  - (C) Ordered sampling units
  - (D) None of the above
52. The use of auxiliary variable is evident in :
- (A) Ratio method
  - (B) Regression method
  - (C) PPS Sampling
  - (D) All of the above
53. The auxiliary variable chosen for the ratio method of estimation must be :
- (A) Linearly correlated with the response variable
  - (B) The regression line between the auxiliary variable and response variable must pass through origin
  - (C) Both (A) and (B)
  - (D) None of the above
54. The following are the methods to obtain a PPS sample :
- (A) Cumulative Total Method
  - (B) Lahiri's Method
  - (C) Both (A) and (B)
  - (D) None of the above
55. The following are the examples of non-sampling errors :
- (A) Measurement Error
  - (B) Response Error
  - (C) Non-Response Error
  - (D) All of the above
56. The issue of non-response can be handled using :
- (A) Call backs
  - (B) Prior appointment
  - (C) Developing a rapport with the respondents
  - (D) All of the above
57. Randomised Response Technique is particularly useful in handling :
- (A) Untruthful answers related to sensitive issues
  - (B) Measurement errors
  - (C) Sampling frame error
  - (D) Sampling error
58. The comparison between ratio estimator and regression estimator suggests that :
- (A) ratio estimator is more efficient than regression estimator
  - (B) regression estimator is more efficient than ratio estimator
  - (C) both are equally efficient
  - (D) Cannot be determined
59. The response error in sample survey arises due to :
- (A) Failing memory of respondents
  - (B) Social desirability bias
  - (C) Both (A) and (B)
  - (D) None of the above
60. The following are the characteristics of the sample which is selected randomly :
- (A) It is not average of the whole
  - (B) It would be representative
  - (C) It would be equal to the population
  - (D) All of the above