

M. Sc. Entrance Examination, 2026
Statistics/Applied Statistics and Informatics
Subject Code : 58715

Day and Date : Tuesday, 12-05-2026

Total Marks : 100

Time : 10.30 a.m. to 12.00 p.m.

Instructions :

1. All questions are compulsory.
2. All questions carry equal marks.

Questions: Choose most correct alternatives

1. Which graph is most suitable for cumulative frequencies?
A) Histogram
B) Ogive
C) Bar diagram
D) Pie chart
2. Coefficient of variation is
A) Unit dependent
B) Absolute measure
C) Relative measure
D) Positional measure
3. If a sample space has 3 elements, then the total number of possible events is
A) 3
B) 6
C) 8
D) 9
4. Which is incorrect for independent events?
A) $P(A \cap B) = P(A)P(B)$
B) $P(A | B) = P(A)$
C) $P(B | A) = P(B)$
D) $P(A \cup B) = P(A) + P(B)$
5. The mean square deviation is minimum when it is taken from.....
A) mean
B) median
C) mode
D) None of these
6. If correlation coefficient (r) is 0, then the regression coefficients are
A) Both one
B) One zero and other one
C) Both zero
D) Undefined

7. If the coefficient of colligation (Y) is zero then the coefficient of association (Q) is...

- A) 0
- B) 1
- C) -1
- D) undefined

8. Gross reproduction rate (GRR) differs from total fertility rate (TFR) because it considers

- A) Only female births
- B) Only male births
- C) Mortality
- D) Migration

9. Hypergeometric distribution approximates to Binomial distribution when...

- A) Sample size is large fraction small
- B) Population size is small
- C) Population size is large and sample
- D) None of these

10. Which of the following distribution has memoryless property?

- A) Poisson
- B) Binomial
- C) Negative binomial
- D) Geometric

11. If a continuous random variable X has p.d.f.

$$f(x) = \begin{cases} \frac{c}{2}, & 1 < x < 3 \\ 0, & \text{otherwise} \end{cases}$$

then the value of c is

- A) 1
- B) 2
- C) 3
- D) 4

12. The Jacobian transformation of $Y = \frac{1}{X}$ is

- A) $\log y$
- B) $\log x$
- C) $-\frac{1}{y^2}$
- D) $-\frac{1}{x^2}$

13. If $X \sim \text{Gamma}(\text{scale} = 1, \text{Shape} = 3)$, then mode of the distribution is

- A) $\frac{1}{2}$
- B) 2
- C) 3
- D) $\frac{1}{3}$

14. Partial regression coefficients are independent of change of

- A) Origin
- B) Scale
- C) Both origin and scale
- D) Neither origin nor scale

15. Fisher's index number is
- A) A.M. of Laspeyre's and Paasche's index numbers
 B) G.M. of Laspeyre's and Paasche's index numbers
 C) H.M. of Laspeyre's and Paasche's index numbers
 D) None of these
16. If $X \sim N(1, 25)$, then third central moment is
- A) 5
 B) 25
 C) 125
 D) 0
17. A chi-square random variable has variance 12 then its mode is
- A) 6
 B) 4
 C) 24
 D) None of these
18. If $X \sim F_{(n,n)}$ then mode of the distribution is
- A) $\frac{n-2}{n+2}$
 B) $\frac{n+2}{n-2}$
 C) $\frac{n}{n+2}$
 D) $\frac{n}{n-2}$
19. The variation in the production due to strike in a company is
- A) Seasonal variations
 B) Cyclical variations
 C) Secular trend
 D) Irregular variations
20. For fraction defective chart is suitable.
- A) p-chart
 B) c-chart
 C) R-Chart
 D) None of these
21. The ratio of iid standard normal variate is _____
- A) Laplace
 B) Lognormal
 C) Cauchy
 D) Weibull
22. Which of following distributions can be expressed in terms of power series?
- A) Binomial
 B) Pareto
 C) Logistic
 D) Lognormal
23. If X is truncated exponential variate with rate parameter θ , truncated to left below at a then $E(X) =$ _____
- A) $\frac{1}{\theta}$
 B) $a + \frac{1}{\theta}$
 C) $\frac{1}{\theta^2}$
 D) a

39. If T_n is consistent estimator of parameter θ , then e^{T_n} is estimator of e^θ .
- A) Consistent
B) Unbiased
C) Unbiased and consistent
D) None of these
40. If $E(\theta - T) < 0$, it is said to be estimator.
- A) Unbiased
B) Negatively Biased
C) Positively Biased
D) Either Negatively or Positively Biased
41. Consider Simple Random Sampling With Replacement (SRSWR(N, n)). The probability of not selecting a particular unit in one draw is:
- A) $1/n$
B) $(N - 1)/N$
C) n/N
D) $1/N$
42. Which sampling method does not use random selection?
- A) Simple random sampling
B) Stratified sampling
C) Purposive sampling
D) Systematic sampling
43. In Simple Random Sampling (SRS), the sample mean is an unbiased estimator:
- A) population variance
B) population mean
C) population standard deviation
D) coefficient of variation
44. If the population size is $N = 100$ and the sample size is $n = 10$, then the sampling fraction is:
- A) 0.1
B) 1000
C) 10
D) 90
45. In systematic sampling, if the population size is $N = 100$ and the sample size is $n = 10$, then the sampling interval k is:
- A) 5
B) 10
C) 20
D) 100
46. Neyman allocation in stratified sampling is based on:
- A) equal sample sizes
B) cost only
C) stratum size and variability
D) population mean
47. Cluster sampling is preferred when:
- A) widely spread population
B) large sample
C) homogeneous population
D) small sample

48. Snowball sampling selects respondents through:

- A) lottery
 B) previous respondents
 C) census list
 D) random numbers

49. Consider the following statements:

Statement I: The regression estimator is always better than the SRS estimator.

Statement II: The regression estimator and ratio estimator are equivalent if the regression line passes through the origin.

- A) Only Statement I is true
 B) Only Statement II is true
 C) Both Statement I and Statement II are true
 D) Neither Statement I nor Statement II is true

50. If the ordering of population units follows a hidden periodic pattern, then which sampling method may give biased or misleading results?

- A) SRSWOR
 B) Systematic sampling
 C) Stratified sampling
 D) Convenient sampling

51. What would be the output of the following R-code?

```
x=c(1:4,5,10:6)
y=c(5:1,10:6)
sum(x==y | x<y)
```

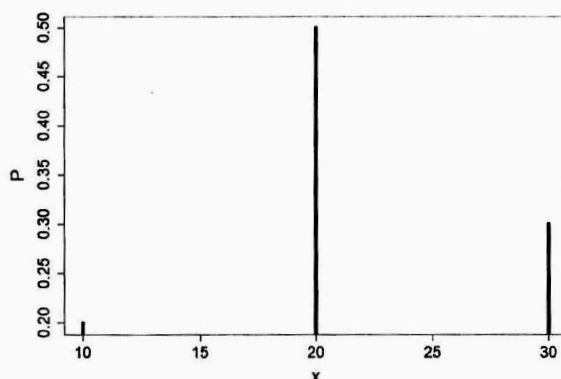
- A) 6
 B) 2
 C) 8
 D) FALSE FALSE TRUE FALSE FALSE TRUE TRUE TRUE TRUE TRUE

52. What would be the output of the following R-code?

```
x=seq(10,100,10)
x[2:3]+x[5:6]
```

- A) 160
 B) 70
 C) 16
 D) None of the above

53. Which of the following command in R will generate following plot?



- A) `x=c(10,20,30); p=c(0.2,0.5,0.3); plot(x,p,type="h")`
 B) `x=c(10,20,30); p=c(0.2,0.5,0.3); plot(p,x,type="h")`
 C) `x=c(10,20,30); p=c(0.2,0.5,0.3); plot(x,p)`
 D) `x=c(10,20,30); p=c(0.2,0.5,0.3); plot(x,p,type="l")`

54. The output of the following R program is...

```
t=0
for(i in c(45,12,18)){
  if(i%%2==0){
    t=t+1
  }else{
    t=t-1
  }
}
t
```

- A) 0
 B) 1
 C) 2
 D) 3

55. The output of the following R program is...

```
t=1
s=2
for(i in 1:3){
  t=t-i
  s=s+i
  t=t+s
}
print(c(t,s))
```

- A) 3 3
 B) 11 8
 C) 6 5
 D) 1 2

56. The main purpose of a check sheet is to:

- A) Analyze correlation
- B) Collect and organize data
- C) Identify root causes
- D) Monitor process stability

57. is not the dimension of quality.

- A) Aesthetics
- B) Features
- C) Durability
- D) Cost

58. Let X_i denote the i^{th} observation from a process with in-control mean μ_0 . In CUSUM chart, let K be the reference value. The lower one-sided CUSUM statistic C_i^- is used to detect downward shifts in the process mean.

Which of the following correctly defines the lower one-sided CUSUM statistic?

- A) $C_i^- = \max(0, C_{i-1}^- + X_i - (\mu_0 + K))$
- B) $C_i^- = \min(0, C_{i-1}^- + X_i - (\mu_0 - K))$
- C) $C_i^- = \min(0, C_{i-1}^- - X_i - (\mu_0 - K))$
- D) $C_i^- = X_i - (\mu_0 + K)$

59. For which value of the smoothing parameter λ , the EWMA chart places all its weight on the most recent observation, behaving like a Shewhart chart?

- A) $\lambda = 0$
- B) $\lambda = 0.5$
- C) $\lambda = 1$
- D) $\lambda = 2$

60. In acceptance sampling, the risk of rejecting a good quality lot is known as

- A) Consumer's risk
- B) Producer's risk
- C) a Type II error
- D) a Type I error

61. Let X_1, X_2, \dots, X_n be a random sample drawn from the $U(0, 1)$ distribution. Let $X_{(i)}$ denote the i^{th} order statistic. Then the pdf of $X_{(i)}$ is:

- A) $f_{X_{(i)}}(x) = \frac{n!}{(i-1)!(n-i)!} x^{i-1}(1-x)^{n-i}, \quad 0 < x < 1$
- B) $f_{X_{(i)}}(x) = x^n$
- C) $f_{X_{(i)}}(x) = (1-x)^n$
- D) $f_{X_{(i)}}(x) = \frac{1}{n}$

62. Let X_1, X_2, \dots, X_n be a random sample from a continuous distribution. Let $X_{(1)}$ and $X_{(n)}$ denote the minimum and maximum order statistics respectively. Then the joint pdf $f_{X_{(1)}, X_{(n)}}(x, y)$ is non-zero only when:

- A) $x < y$
- B) $x > y$
- C) $x = y$
- D) Always non-zero

63. If $X_n \xrightarrow{P} X$ but not almost surely, then:
- A) Always converges in distribution C) Diverges
 B) Never converges in distribution D) Converges in mean square
64. Suppose $Var(X) = \sigma^2 < \infty$. Using Chebyshev inequality, then $P(|X - \mu| \geq 2\sigma)$ is:
- A) $\frac{1}{2}$ C) $\frac{1}{8}$
 B) $\frac{1}{4}$ D) $\frac{1}{16}$
65. Let $X_i \sim Bernoulli(p)$. Using CLT, the approximate distribution of $\sum X_i$ for large n is:
- A) $N(np, np(1-p))$ C) Uniform
 B) Poisson(np) D) Exponential
66. A system has structure function $h(p) = p^3 + 3p^2(1-p)$. This corresponds to:
- A) Series system C) 2-out-of-3 system
 B) Parallel system D) Bridge system
67. If components have hazard rates $h_1(t), h_2(t)$, the hazard of series system is:
- A) $h_1 + h_2$ C) $h_1 - h_2$
 B) $h_1 h_2$ D) $\frac{h_1}{h_2}$
68. If $T \sim Exp(\lambda)$, then memoryless property implies:
- A) $P(T > s + t | T > s) = P(T > t)$ C) $P(T > t) = 0$
 B) $P(T > s + t) = P(T > s)$ D) None
69. For a parallel system of n identical components with reliability p , system reliability is:
- A) p^n C) np
 B) $1 - (1-p)^n$ D) p/n
70. If a system has increasing hazard rate, then it belongs to:
- A) DFR class C) Constant hazard
 B) IFR class D) No failure
71. Let X_1, X_2, \dots, X_n be a random sample from an exponential distribution with pdf

$$f(x; \theta) = \theta e^{-\theta x}, \quad x > 0, \quad \theta > 0.$$

Which of the following is a pivotal quantity for θ ?

- A) \bar{X}/θ C) $(\sum_{i=1}^n X_i)/\theta^2$
 B) $2\theta \sum_{i=1}^n X_i$ D) $\bar{X} - \theta$

72. If \bar{X} is the mean of a random sample of size n taken from a $N(\mu, 3^2)$ distribution, the value of n such that

$$P[\bar{X} - 1 < \mu < \bar{X} + 1] = 0.90$$

is ... (take $z_{0.05} = 1.64$)

- A) 30
B) 50
C) 28
D) 24
73. The Neyman-Pearson fundamental lemma gives the method of construction of ...
- A) Uniformly most powerful test
B) Most powerful test
C) Unbiased test
D) Randomized test
74. One observation is drawn from a population with pdf as

$$f(x, \theta) = \begin{cases} \frac{1}{\theta}, & 0 < x < \theta \\ 0, & \text{otherwise} \end{cases}$$

For testing $H_0 : \theta = 1$ against $H_1 : \theta = 2$, the critical region is $X > \frac{1}{2}$. Then, probability of type II error is

- A) 0.25
B) 0.50
C) 0.75
D) 0.95
75. Consider a random sample of size 64 from a normal population with mean μ and standard deviation σ (unknown). The computations obtained from 64 sample observations are $\bar{x} = 60.4$ and $s^2 = 100$. The 95% confidence interval for μ is ... (use $Z_{0.025} = 1.96$)
- A) (58.44, 62.36)
B) (57.95, 62.85)
C) (50.4, 70.4)
D) (58.32, 62.48)
76. Which of the following statements about SPRT is correct?
- A) SPRT minimizes the average sample number for given (α, β)
B) The sample size in SPRT is fixed in advance
C) SPRT always requires larger sample size than fixed-sample tests
D) SPRT cannot control Type I and Type II errors
77. In a test of randomness of a given set of observations (7, 19, 3, 1, 8, 5, 10, 4), when the null hypothesis of randomness of the observations is true, then the expected number of runs U and its variance are respectively:
- A) $4, \frac{12}{7}$
B) $5, \frac{12}{7}$
C) $4, \frac{20}{7}$
D) $5, \frac{20}{7}$

78. A manufacturer claims that the lifetime of its product is more than 250 hours. To verify its claim based on 24 randomly observed lifetimes, which one of the following tests can be used?
- A) Sign test
B) Kolmogorov-Smirnov test
C) Median test
D) Mann-Whitney test
79. Which of the following is a limitation of the Wilcoxon signed-rank test?
- A) It cannot be applied to paired data
B) It requires the population to be symmetric
C) It cannot handle small samples
D) It ignores the magnitude of observations
80. Which one of the following non-parametric tests is analogous to the chi-square test of goodness of fit?
- A) Mann-Whitney test
B) Wilcoxon signed-rank test
C) Median test
D) None of these
81. To obtain the valid estimate of experimental error which of the following principles are used?
- A) Replication and Randomization
B) Randomization and local control
C) Replication and local control
D) Replication, Randomization and local control
82. In confounding, generally which order of interactions is confounded
- A) Lower order
B) First order
C) Higher order
D) All of the above
83. In ANOVA involving 3 treatments with 10 observations per treatments, and $SSE = 399.6$. Then mean sum of square due to error is
- A) 133.2
B) 13.32
C) 14.8
D) 30.0
84. Let $SS_E(R)$ denote the error sum of squares obtained from a Randomized Block Design (RBD) and $SS_E(C)$ denote the same obtained from a Completely Randomized Design (CRD), using the same experimental material. Then $SS_E(R)$ is expected to be ... $SS_E(C)$.
- A) same as
B) greater than
C) less than
D) Can't Say

93. In graphical method, multiple optimal solutions occur when:
- A) Feasible region is unbounded
 - B) Objective function is parallel to a constraint boundary
 - C) Constraints are inconsistent
 - D) Only one corner point exists
94. An unbounded solution in LPP means:
- A) No feasible solution exists
 - B) Objective function value can increase indefinitely
 - C) All constraints are satisfied
 - D) Solution is degenerate
95. Which of the following is NOT a method to obtain IBFS in transportation problem?
- A) North-West Corner Rule
 - B) Least Cost Method
 - C) Hungarian Method
 - D) Vogel's Approximation Method
96. Assignment problem is a special case of:
- A) Sequencing problem
 - B) Quadratic programming only
 - C) Transportation problem
 - D) Simulation model
97. For sequencing of n jobs on two machines, the rule used is:
- A) Johnson's Rule
 - B) MODI Method
 - C) Simplex Method
 - D) Hungarian Method
98. In $M/M/1$ queue model, service time follows:
- A) Poisson distribution
 - B) Uniform distribution
 - C) Normal distribution
 - D) Exponential distribution
99. Which property is essential for random numbers in simulation?
- A) Predictability
 - B) Increasing sequence
 - C) Independence
 - D) Deterministic nature
100. The Laplace criterion in decision theory assumes:
- A) Equal probabilities of states of nature
 - B) Complete pessimism
 - C) Complete optimism
 - D) Minimum regret

