Questions

1. If we have the last census population, migration, births and deaths data for a region in a given period, the population at the time t can be estimated by the formula as:

(A) $\widehat{P_t}$= P_0 + (B-D) + (I-E)
(B) $\widehat{P_t}$= (B-D) + (I-E)
(C) $\widehat{P_t}$ = P_0 {(B-D) + (I-E)}
(D) None of the above

2. Having known the last census population 'P0' and growth rate 'r', the population after n years based on compound interest formula will be:

(A) $\widehat{P_t}= P_0 (1+r)^n$ (B) $\widehat{P_t}= P_0 (1+n)^r$
(C) $\widehat{P_t} =P_0/(1+r)^n$ (D) $\widehat{P_t}= P/(1+r)^n$

3. Net reproduction rate is more viable than gross reproduction rate because:

(A) It takes into account fertility rates as well as mortality rates.
(B) It makes use of life tables.
(C) It utilizes survival rate
(D) All the above.

4. Construction of life table is based on the assumption that:

(A) Age specific death rates are constant at all ages.
(B) Death rates are uniformly distributed between two birth days.
(C) Mortality rates are same for male and female population.
(D) All the above.

5. Let X=R with usual distance function d(x,y)=|x-y|, let E={y∈R| 2 < y < 5 }, then following is the interior point of E

(A) 2 and 5 (B) 2.5 and 5
(C) 3 and 4 (D) 1.5 and 2.5

6. Let X=R with usual distance function d(x,y)=|x-y|, let E = {1/n | n =1,2,3--------}, then the limit point of E is

(A) 1 (B) ½ (C) 1/n (D) 0

7. A finite set __________

(A) Has no limit points
(B) Is compact
(C) Both (A) and (B)
(D) None of these

8. The function $f(x) = 1/(1-x^2)$ can be represented in power series as:

(A) $\sum_{n=0}^{\infty} x^n$ (B) $\sum_{n=0}^{\infty} x^{2n}$ (C) $\sum_{n=0}^{\infty} x^{n+1}$ (D) $\sum_{n=0}^{\infty} x^{n+2}$

9. Which of the following statements is not true?
(A) A convergent sequence is always bounded.
(B) A sequence which diverges to ∞, must be bounded below.
(C) An oscillating sequence is always bounded.
(D) A sequence which diverges to - ∞, must be bounded above.

10. Which of the following sequences $\{S_n\}_{n=1}^{\infty}$ diverges to $-\infty$?

(A) $S_n = e^{1/n}, n \in I$ (B) $S_n = -n^2 \quad , n \in I$

(C) $S_n = e^n \quad , n \in I$ (D) $S_n = 1/n \quad , n \in I$

11. Let L be the greatest lower bound for set A. Consider the following two statements.
S_1: L must be lower bound for A.
S_2: no number greater than L is a lower bound for A.

(A) Both S_1 and S_2 are true.
(B) Only S_1 is true.
(C) Only S_2 is true.
(D) None of S_1 and S_2 is true.

12. A reduced Latin square (or a Latin square in standard form) is one in which
(A) Treatments in the first row are arranged in alphabetic order
(B) Treatments in the first column are arranged in alphabetic order
(C) Treatments in the first row and first column are arranged in alphabetic order
(D) None of the above

13. If interaction AB is confounded in a 2^3 factorial experiment , the entries of two blocks in a replication will be

(A) b,ac,bc,a and (1) ,ab,c ,abc (B) (1),ab,a,b and abc,c,bc,ac
(C) (1),ab,ac,bc and abc,a,b,c (D) None of the above

14. While conducting a one way ANOVA, comparing five treatments with ten observations per treatment, let SST = 42.41 and MSE = 6.34. What is the value of F?

(A) 42.41 (B) 6.34 (C) 1.67 (D) 0.74

15. When a problem matrix does not contain identity matrix, we have to use
(A) Dual complex method (B) Artificial basis technique
(C) Sensitivity analysis (D) None of the above

16. For a random variable having a normal distribution, the ratio of its range to the standard deviation is called _____

(A) Relative range (B) Absolute range (C) Major range (D) Minor range

17. In acceptance sampling, when there is a finite probability that the lot may be accepted even if the quality is not really good, is called

(A) Consumer's risk (B) Producer's risk

(C) Operator's risk (D) Owner's risk

18. The decision about the acceptance or rejection of a lot through a single sampling plan is reached by considering

(A) Number of defectives in the sample and acceptance number
(B) Rejecting quality level
(C) The acceptance quality level
(D) Average outgoing quality limit

19. Two biased coins C_1 and C_2 have probability of getting heads $\frac{2}{3}$ and $\frac{3}{4}$ respectively, when tossed. If both coins are tossed independently two times each, then the probability of getting exactly two heads out of these four tosses is

(A) $\frac{1}{4}$ (B) $\frac{37}{144}$ (C) $\frac{41}{144}$ (D) $\frac{49}{144}$

20. Let X be a random variable with distribution function

$$F(x) = \begin{cases} 0, \quad x < 0 \\ \frac{1}{4} + \frac{4x - x^2}{8}, 0 \leq x < 2 \\ 1, \quad x \geq 2 \end{cases}$$

Then $\mathrm{P}(X = 0) + \mathrm{P}(X = 1.5) + \mathrm{P}(X = 2)$ equals

(A) $\frac{1}{4}$ (B) $\frac{3}{8}$ (C) $\frac{5}{8}$ (D) $\frac{1}{2}$

21. A non negative continuous random variable X has pdf

$$f(x) = \frac{1}{8\,\Gamma(3)} e^{-x/2} x^2, \quad x > 0.$$

Then E(X) and Var(X) are respectively

(A) 6, 6 (B) 6, 12

(C) 6, 18 (D) 8, 16.

22. Let the MGF of a r.v. X is $M_X(t) = e^{2t+8t^2}$, t∈R. Then P[X<2] is

(A) 0.5 (B) 0

(C) 0.25 (D) 0.75.

23. Let the MGF of r.v. X is $M_X(t) = (1-2t)^{-8}$, t< ½. Then the distribution of X is

(A) χ_2^2 (B) χ_4^2 (C) χ_8^2 (D) χ_{16}^2.

24. Let m be the number of occurrences of an event A in n independent trials which is denoted as $P_n(m)$, where probability of occurrence of A in each of these trials is $p, 0 < p < 1$. If n is very large and p differs much from 0.5, then which of the following law gives better approximation of $P_n(m)$?

(A) Binomial probability law

(B) Poisson probability law

(C) DeMoivre-Laplace Local Limit Theorem

(D) DeMoivre-Laplace Integral Limit Theorem

25. If the sequence of random variables $Z_1, Z_2, \dots, Z_n$ is such that it satisfies $\frac{1}{n}\sum_{k=1}^{n} Z_k - \frac{1}{n}\sum_{k=1}^{n} E(Z_k) \to 0 \; with\; probability\; 1\; as\; n \to \infty$, then it is said to obey

(A) strong law of large numbers
(B) weak law of large numbers
(C) the property of convergence with probability 1
(D) none of the above

26. Match the characteristic functions against the correct probability distribution (*a* and *b* are parameters):

(i)	Binomial	(a)	$\frac{e^{itb} - e^{ita}}{it\,(b-a)}$
(ii)	Exponential	(b)	$(1-2it)^{-a/2}$
(iii)	Normal	(c)	$\left(1-b+be^{it}\right)^{a}$
(iv)	Uniform	(d)	$(1-ita^{-1})^{-1}$
		(e)	$e^{ita-\frac{1}{2}t^2b^2}$

(A) (i) - (a) , (ii) - (b) , (iii) - (e) , (iv) - (c)
(B) (i) - (e) , (ii) - (d) , (iii) - (c) , (iv) - (a)
(C) (i) - (c) , (ii) - (d) , (iii) - (e) , (iv) - (a)
(D) (i) - (c) , (ii) - (b) , (iii) - (e) , (iv) - (a)

27. Let $M = \begin{bmatrix} \frac{1}{4} & \frac{3}{4} \\ \frac{3}{5} & \frac{2}{5} \end{bmatrix}$, If I is the 2x2 identity matrix and 0 is the 2x2 zero matrix, then

(A) $20\,M^2 - 13\,M + 7\,I = 0$

(B) $20\,M^2 - 13\,M - 7\,I = 0$

(C) $20\,M^2 + 13\,M + 7\,I = 0$

(D) $20\,M^2 + 13\,M - 7\,I = 0$

28. Which of the following is a centering matrix of order 3?

(A) $\begin{bmatrix} 1/3 & 2/3 & 2/3 \\ 2/3 & 1/3 & 1/3 \\ 1/3 & 1/3 & 2/3 \end{bmatrix}$ (B) $\begin{bmatrix} -1/3 & 2/3 & 2/3 \\ 2/3 & -1/3 & 2/3 \\ 2/3 & 2/3 & -1/3 \end{bmatrix}$

(C) $\begin{bmatrix} 1/3 & -2/3 & -2/3 \\ -2/3 & 1/3 & -2/3 \\ -2/3 & -2/3 & 1/3 \end{bmatrix}$ (D) $\begin{bmatrix} 2/3 & -1/3 & -1/3 \\ -1/3 & 2/3 & -1/3 \\ -1/3 & -1/3 & 2/3 \end{bmatrix}$

29. Let T be a linear transformation of $V_n\ (\mathcal{F})$ represented by matrix A relative to the basis $\alpha_1, \alpha_2, \ldots, \alpha_n$ and represented by matrix B relative to the basis $\beta_1,\ \beta_2, \ldots, \beta_n$. Then matrices A and B are

(A) non singular (B) congruent (C) similar (D) orthogonally similar

30. The variance covariance matrix of a random vector is always

(A) Positive definite (B) Positive semidefinite

(C) negative definite (D) negative semidefinite.

31. Let X be a discrete random variable with pmf

$$P(X = x) = \begin{cases} \frac{1}{\theta}, & x = 1, 2, 3, \ldots \theta \\ 0, & Otherwise \end{cases}$$

Where $\theta \in \{20, 40\}$ is the unknown parameter. Consider testing $H_0: \theta = 40$ against $H_1: \theta = 20$ at level $\alpha = 0.1$. Then the most powerful test rejects H_0 if and only if

(A) $X \leq 4$ (B) $X > 4$ (C) $X \geq 3$ (D) $X < 3$.

32. Let α and η denote respectively Probability of Type I error and power of a MP test. Then which of the following is true?

(A) $\alpha = \eta$ (B) $\alpha \leq \eta$ (C) $\alpha > \eta$ (D) nothing can be said.

33. Let $X_1, X_2, \ldots, X_n$ be a random sample from $N(\mu, \sigma^2)$,both μ and σ^2 unknown. The critical region for testing $H_0 : \mu = \mu_0$ against $H_1 : \mu \neq \mu_0$ at level α is

(A) $\bar{X} \geq \mu_0 + \frac{S}{\sqrt{n}} t_{n-1,\alpha}$ (B) $\bar{X} \leq \mu_0 + \frac{S}{\sqrt{n}} t_{n-1,1-\alpha}$

(C) $\left|\frac{\bar{X}-\mu_0}{S/\sqrt{n}}\right| \geq t_{n-1,\alpha/2}$ (D) $\left|\frac{\bar{X}-\mu_0}{S/\sqrt{n}}\right| \leq t_{n-1,\alpha/2}$.

34. Let X_1, X_2, X_3 be a random sample from B(1, p) distribution. Which of the following is not a sufficient statistic?

(A) $X_1 + X_2 + X_3$ (B) (X_1, X_2, X_3) (C) $(X_1, X_2 + X_3)$ (D) $X_1 - X_2 + X_3$.

35. Let X_1, X_2, X_3 be a random sample from P(λ). Which of the following estimators has the smallest variance?

(A) $\frac{X_1 + X_2 + 4X_3}{6}$ (B) $\frac{X_1 + X_2 + X_3}{3}$ (C) $\frac{X_1 + 3X_2 + X_3}{5}$ (D) $\frac{2X_1 + X_2 + 2X_3}{5}$.

36. In the Gauss- Markoff set up, with usual notations suppose matrix X = $\begin{bmatrix} 1 & 2 \\ 3 & 4 \\ 5 & 6 \end{bmatrix}$. Then which of the following is correct?

(A) no parametric function is estimable
(B) All parametric functions are estimable
(C) Only some parametric functions are estimable
(D) nothing can be said.

37. A sequence of estimators $\{T_n, n \geq 1\}$ is said to be consistent for θ if

(A) $P[|T_n - \theta| < \varepsilon] \geq 1-\eta$ (B) $P[|T_n - \theta| < \varepsilon] < \eta$

(C) $P[|T_n - \theta| > \varepsilon] \geq 1-\eta$ (D) $P[|T_n - \theta| > \varepsilon] > \eta$.

38. In usual notations (matrix form) the LSE of $\underline{\beta}$ in the model $\underline{Y} = X\underline{\beta} + \underline{\varepsilon}$ is given by
(A) $\underline{b} = (X'X)^{-1}\underline{Y}$ (B) $\underline{b} = (X'X)^{-1}X$ (C) $\underline{b} = (X'X)^{-1}X\underline{Y}$ (D) $\underline{b} = (X'X)^{-1}X'\underline{Y}$

39. In the usual regression equation Z_i^2 which are the functions of X_i's, for Z_1, Z_2, Z_3, Z_4, Z_5 total number of possible equations would be
(A) 5 (B) 10 (C) 32 (D) 64

40. Dummy variables classify the data into

(A) Inclusive categories (B) Mutually exclusive categories

(C) Qualitative categories (D) Quantitative categories

41. In the stepwise regression procedure, a predictor variable is included in the model based on the outcome of

(A) F test (B) Partial F test (C) χ^2 test (D) t test

42. The Gompertz curve is generally

(A) U shaped (B) S shaped (C) Exponentially damped (D) Fluctuating

43. If there is a trend present in the series and the variance appears to increase with mean, then which of the following transformations is used to stabilize the variance?

(A) Inverse (B) Logarithmic (C) Square root (D) Trigonometric

44. With which characteristic movement of a time series would you associate the series on Production of groundnut?

(A) Seasonal (B) Cyclic (C) Long term trend (D) Short term trend

45. Suppose there is a population of 500 students attending a school in Mumbai City. If we divided them by gender and then took a random sample males and females separately, the variable on which we divided the population is called the _______

(A) Independent variable (B) Dependent variable

(C) Stratification variable (D) Sampling variable

46. The discrepancy in a sample estimate due to miscalculation is termed as

(A) Human error (B) Formula Error

(C) Sampling error (D) Non-sampling error

47. Which of the following statements is true about the number of strata?

(A) Less the number of strata, better it is.

(B) More the number of strata, better it is.

(C) Number of strata doesn't influence the quality of results

(D) None of the above

48. In which year National Statistical commission was established?

(A) 2007 (B) 2005 (C) 2003 (D) 2002

49. Let $X_1, X_2, \ldots, X_n$ be a random sample from $U(0, \theta)$. The expected value of nth order statistic $X_{(n)}$ is ______

(A) $\frac{n}{n+1}\theta$ (B) $\frac{n+1}{n}\theta$ (C) $\frac{n}{n-1}\theta$ (D) $\frac{n-1}{n}\theta$

50. Suppose a random sample of size n is drawn from an exponential distribution with mean $1/\theta$. Then for range R, $E\left(e^{-\theta R}\right)$ is ___

(A) $\frac{1}{n+1}$ (B) $\frac{1}{n}$ (C) $\frac{\theta}{n+1}$ (D) $\frac{\theta}{n}$

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Answer Key

Question	Answer	Question	Answer	Question	Answer	Question	Answer	Question	Answer
1	A	11	A	21	B	31	A	41	B
2	C	12	C	22	A	32	B	42	B
3	A	13	A	23	D	33	C	43	B
4	D	14	C	24	B	34	D	44	A
5	C	15	B	25	A	35	B	45	C
6	D	16	A	26	C	36	B	46	D
7	C	17	A	27	A	37	A	47	B
8	B	18	A	28	D	38	D	48	B
9	C	19	B	29	C	39	C	49	A
10	C	20	D	30	B	40	B	50	B