

English

1.

Which combination of the following statements are true in connection to the mgf of random variable(s)

- i. $M_{cX}(t) = M_X(ct)$
- ii. $M_{X+Y}(t) = M_X(t) + M_Y(t)$
- iii. $M_{(X+a)/b}(t) = e^{at/b} M_X(t/b)$
- iv. $M_{(X-\mu)/\sigma}(t) = e^{-\mu t/\sigma} M_X(t/\sigma)$

- (A) (i) True (ii) False (iii) True (iv) True
- (B) (i) False (ii) False (iii) True (iv) True
- (C) (i) True (ii) True (iii) True (iv) True
- (D) (i) True (ii) False (iii) True (iv) False

Correct Option(s): A

English

2.

If X is a random variable defined on (Ω, S) and a and b are constants then $aX + b$

- (A) a random variable from $(\Omega, aS+b)$
- (B) a random variable from (Ω, S)
- (C) a random variable from $(a\Omega + b, S)$
- (D) a linear function and not a random variable

Correct Option(s): B

English

3.

If two random variables X and Y are independent then the $\text{Cov}(X, Y) =$

- (A) 0
- (B) $E(X) E(Y)$
- (C) infinity
- (D) correlation of (X, Y)

Correct Option(s): A

English

4.
The MGF of a Poisson distribution with mean λ is given by

- (A) $\exp(\lambda t)$
- (B) $\exp\{\lambda(e^t - 1)\}$
- (C) $\exp\{\lambda(e^t - \lambda)\}$
- (D) $\exp\{-\lambda(e^t + 1)\}$

Correct Option(s): B

English

5.
For the Gamma distribution defined as $f(x) = \frac{1}{\Gamma(\alpha)\beta^\alpha} x^{\alpha-1} e^{-x/\beta}$ the moment is given by

- (A) $(1 - \beta t)$
- (B) $(1 - \beta t)^\alpha$
- (C) $(1 - \beta t)^{-\alpha}$
- (D) $(1 - \alpha t)^{-\beta}$

Correct Option(s): C

English

6.
Assertion (A): The Kolmogorov-Smirnov goodness of fit test is more powerful
goodness of fit

Reasoning (R): The Kolmogorov-Smirnov test utilizes information from all th

- (A) A is true but R is not
- (B) Both A and R are true
- (C) Both A and R are false
- (D) A is false but R is true

Correct Option(s): B

English

7.

Match the following functions of Group A to appropriate formula in Group B

GROUP A

GROUP B

- (i) Characteristic Function
- (ii) Moment Generating Function
- (iii) Factorial Moment
- (iv) Probability Generating Function

- (a) $E(e^{tX})$
- (b) $E(X^{(r)})$
- (c) $E(t^X)$
- (d) $E(e^{itX})$

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

Correct Option(s): C

English

8.

Let X_1, X_2, \dots, X_n be IID random variables from a distribution with pdf

$$f(x) = \frac{1}{2} \lambda^3 x^2 e^{-\lambda x}, x > 0, \lambda > 0$$

then which of the following statements are correct:

- i. $\frac{2}{n} \sum_{i=1}^n \frac{1}{x_i}$ is an unbiased estimator of λ
- ii. $\sum_{i=1}^n \frac{3n}{x_i}$ is an unbiased estimator of λ
- iii. $\frac{2}{n} \sum_{i=1}^n \frac{1}{x_i}$ is a consistent estimator of λ
- iv. $\sum_{i=1}^n \frac{3n}{x_i}$ is a consistent estimator of λ

- (A) (i) True (ii) False (iii) True (iv) True
- (B) (i) False (ii) False (iii) True (iv) True
- (C) (i) True (ii) True (iii) True (iv) True
- (D) (i) True (ii) False (iii) True (iv) False

Correct Option(s): D

English

9.

Let X_1, X_2, \dots, X_n be a random sample from uniform distribution with range $(0, 1)$. $X_{(1)}, \dots, X_{(n)}$ be the corresponding order statistics. Which of the following is a $100(1-\alpha)\%$ confidence interval for θ ?

- i. $(-\infty, X_{(n)} - \alpha^{1/n})$
- ii. $(X_{(1)} + \alpha^{1/n} - 1, \infty)$
- iii. $(X_n + (\alpha/2) - 1, X_n - (\alpha/2))$
- iv. $(-\infty, X_1 - (\alpha/2))$

- (A) (i) True (ii) True (iii) True (iv) False
- (B) (i) False (ii) False (iii) True (iv) True
- (C) (i) True (ii) True (iii) True (iv) True
- (D) (i) True (ii) False (iii) True (iv) False

Correct Option(s): A

English

10.

Here two statements are labelled as Assertion (Ass) and Reason (R):

Ass: Wilcoxon Test is a generalization of the ordinary sign test

R: The ordinary sign test takes into consideration only the signs of the differences of the observations and the assumed median whereas Wilcoxon test uses their magnitudes.
Now identify which of the following is correct.

- (A) Both Ass and R are correct
- (B) Ass is correct but R is not
- (C) Both Ass and R are False
- (D) Ass is false but R is correct

Correct Option(s): A

English

11.

Here two statements are labelled as Assertion (Ass) and Reason (R):

Ass: Non-sampling errors are present both in census as well as in sample survey

R: Non-sampling errors are caused by factors which are beyond human control

Now identify which of the following is correct.

- (A) Both Ass and R are correct but R is not the correct explanation of Ass
- (B) Both Ass and R are correct and R is the correct explanation of Ass
- (C) Both Ass and R are False
- (D) Ass is false but R is correct

Correct Option(s): B

English

12.

Match the following functions of Group A to appropriate formula in Group B.

For a 2^2 factorial experiment with usual notation

GROUP A

- (i) Effect of factor N at first level 0 of P
- (ii) Effect of factor N at first level 1 of P
- (iii) Main effect due to P
- (iv) First order interaction between N and P

GROUP B

- (a) $\frac{1}{2}[(np) - (n) - (p) + 1]$
- (b) $\frac{1}{2}[(np) - (n) + (p) - 1]$
- (c) $(np) - (p)$
- (d) $(n) - (1)$

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

Correct Option(s): D

English

13.

Consider a 2^5 factorial experiment laid out as block design with 4 blocks of size 8. Suppose the principal block of this design consists of treatment combination (1, 1, 1, 1, 1) and five others. Which of the following interaction effects cannot be confounded in this design?

i) ABC, CDE, ABDE

ii) ABC, CDE, ABCDE

iii) AB, BC, AC

iv) AB, CDE, ABCDE

(A) (i) True (ii) False (iii) True (iv) True

(B) (i) False (ii) False (iii) True (iv) False

(C) (i) True (ii) True (iii) True (iv) True

(D) (i) True (ii) False (iii) True (iv) False

Correct Option(s): B

English

14.

In a BIBD if all the treatments in each block are replaced by its complementary with notations having their usual meanings, which of the following are true for the complementary design?

i) It is a BIBD

ii) Each treatment occurs $(b - r)$ times

iii) Each pair of treatments appear in the same block $(b - r + \lambda)$ number of times

iv) $bk = vr$

(A) (i) True (ii) False (iii) True (iv) True

(B) (i) False (ii) False (iii) True (iv) False

(C) (i) True (ii) True (iii) False (iv) True

(D) (i) True (ii) False (iii) True (iv) False

Correct Option(s): C

English

15.

Of the four statements given below identify which of them are correct and which are incorrect

- i) Median always lies between mean and mode
- ii) Median takes into account only the order of the values
- iii) In an individual series median is unique if n is odd
- iv) If n is even, then median can be objectively determined

- (A) (i) True (ii) True (iii) True (iv) True
- (B) (i) False (ii) False (iii) True (iv) False
- (C) (i) True (ii) True (iii) False (iv) True
- (D) (i) True (ii) False (iii) True (iv) False

Correct Option(s): A

English

16.

If the probability density function of a variable X is defined as,

$$f(x) = cx(2-x); \quad 0 \leq x < 2 \quad \text{then the value of } c \text{ is}$$

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

Correct Option(s): B

English

17.

If the two lines of regression are coincided, the relation between the two-regres

- (A) $\beta_{YX} \cdot \beta_{XY} = 1$
- (B) $\beta_{YX} \leq \beta_{XY}$
- (C) $\beta_{YX} = \beta_{XY}$
- (D) $\beta_{YX} = -\beta_{XY}$

Correct Option(s): A

English

18.

Which of the following non-parametric test is the non-parametric counterpart o

- (A) Wilcoxon matched pair signed rank test
- (B) Median test
- (C) Kolmogorov-Smirnov test
- (D) Mann-Whitney's test

Correct Option(s): A

English

19.

Which distribution is well known for its lack-of-memory property?

- (A) Geometric Distribution
- (B) Gamma Distribution
- (C) Poisson Distribution
- (D) Beta-binomial distribution

Correct Option(s): A

English

20.

The Pearson's correlation coefficient between Production and Profit is having :
Accordingly, which of the following statement is correct?

- (A) There is a high positive relation between Production and Profit
- (B) If Production increases Profit shall decrease
- (C) There is no trace of any linear relation between Production and Profit
- (D) Production and Profit are independent of each other.

Correct Option(s): C

English

21.

Which one of the following sampling technique is not a probability sampling

- (A) Snowball sampling
- (B) Simple Random Sampling
- (C) Double Sampling
- (D) PPS Sampling

Correct Option(s): A

English

22.

Which one of the following is not a method of estimation

- (A) Method of Maximum Likelihood
- (B) Method of Minimum Chi-square
- (C) Least Square method
- (D) Neyman-Pearson Method

Correct Option(s): D

English

23.

The bias of an estimator can be:

- (A) Always Positive
- (B) Always Negative
- (C) Either positive or negative
- (D) Always zero

Correct Option(s): C

English

24.

Randomization is a process in which the treatments are allocated to the experim

- (A) As the investigator wants
- (B) In a sequence
- (C) With equal probability
- (D) Depending on the type of experimental unit

Correct Option(s): C

English

25.

The mean and variance of a binomial distribution are 8 and 4, respectively. The probability of getting 8 successes in 12 trials is equal to

(A) $\frac{1}{2^{12}}$

(B) $\frac{1}{2^4}$

(C) $\frac{1}{2^6}$

(D) $\frac{1}{2^8}$

Correct Option(s): A

English

26.

An urn A contains 5 white and 3 black balls and B contains 4 white and 4 black balls. A ball is selected and a ball is drawn from it, the probability that the ball is white, is:

(A) $\frac{9}{8}$

(B) $\frac{9}{16}$

(C) $\frac{5}{32}$

(D) $\frac{5}{16}$

Correct Option(s): B

English

27.

If X follows χ^2 distribution with n degrees of freedom and Y follows χ^2 distribution with m degrees of freedom. Then the distribution of $Z = \frac{X}{Y}$ is

- (A) $\beta_2(n, m)$
- (B) $\beta_1(n, \frac{m+n}{2})$
- (C) $\gamma(n, m)$
- (D) $\beta_2(\frac{n}{2}, \frac{m}{2})$

Correct Option(s): D

English

28.

Which of the following inequality is not correct

- (A) $E\left[\frac{1}{X}\right] \leq \frac{1}{E(X)}$
- (B) $E(X^2) \geq [E(X)]^2$
- (C) $V(X) \geq E(X^2)$
- (D) $V(X+Y) \neq V(X) + V(Y)$

Correct Option(s): A

English

29.

In case of the binary logistic regression the dependent variable is

- (A) real numbers
- (B) continuous
- (C) binary
- (D) categorical

Correct Option(s): C

English

30.

In a persistent Markov chain the probability that starting with state i the system the same state i is

- (A) 0
- (B) > 0
- (C) 1
- (D) $\frac{1}{2}$

Correct Option(s): C

English

31.

Which of the following is not an example of Random Walk

- (A) Population Growth
- (B) Limiting form of Wiener Process
- (C) Gambler's Ruin Problem
- (D) Brownian Motion

Correct Option(s): A

English

32.

Which of the following is not an application of Branching Process

- (A) Nuclear Chain Reaction
- (B) Biological problems related to future generation
- (C) Gambler's Ruin Problem
- (D) Survival of Family Names

Correct Option(s): C

English

33.

The theorem in probability that deals with sum of large number of independent variables is called

- (A) Strong law of large numbers
- (B) Central limit theorem
- (C) Weak law of large numbers
- (D) Convergence in probability

Correct Option(s): B

English

34.

If X is a random variable with $E(X) = 3$ and $E(X^2) = 13$, then determine a lower probability $P[-2 < X < 8]$

- (A) $4/5$
- (B) $1/6$
- (C) $21/25$
- (D) $13/25$

Correct Option(s): C

English

35.

The inversion formula of the characteristic function helps us to find the probability density function when the characteristic function of the random variable is known. The formula is given by $f(x) =$

- (A) $\frac{1}{2\pi\sigma} \int_{-\infty}^{\infty} e^{-itx} \phi(t) dt$
- (B) $\frac{1}{2\pi} \int_{-\infty}^{\infty} e^{itx} \phi(t) dt$
- (C) $\int_{-\infty}^{\infty} e^{-itx} \phi(t) dt$
- (D) $\frac{1}{2\pi} \int_{-\infty}^{\infty} e^{-itx} \phi(t) dt$

Correct Option(s): D

English

36.

If X is a random variable dependent on Y then, $\text{Var}(X) =$

- (A) $E[\text{Var}(X|Y)] + \text{Var}[E(X|Y)]$
- (B) $E[\text{Var}(X|Y)]$
- (C) $\text{Var}[E(X|Y)]$
- (D) $E[\text{Var}(X|Y)] - \text{Var}[E(X|Y)]$

Correct Option(s): A

English

37.

An urn contains a white and b black balls, c balls are drawn at random without replacement. The mathematical expectation of the number of white balls drawn is

(A) $\frac{2c}{a+b} + 1$

(B) $\frac{2ac}{a+b}$

(C) $\frac{2a}{b}$

(D) $\frac{ac}{a+b}$

Correct Option(s): D

English

38.

Which statement below about minimal sufficient statistic of a parameter is incorrect?

- (A) It is a sufficient statistic and is a function of every other sufficient statistic
- (B) Not necessarily unbiased
- (C) Always exists
- (D) Not necessarily consistent

Correct Option(s): C

English

39.

The Neyman Pearson Lemma provides us with the

- (A) Maximum Likelihood estimator of a parameter
- (B) Shortest length confidence interval
- (C) Best critical region for testing a simple null hypothesis
- (D) Best critical region for testing a simple null hypothesis against a simple alternative hypothesis

Correct Option(s): D

English

40.

The monotone likelihood ratio test is the uniformly most powerful test for testing

- (A) Simple null against simple alternative
- (B) Simple null against composite alternative
- (C) Composite null against composite alternative
- (D) Composite null against simple alternative

Correct Option(s): C

English

41.

If \mathbf{X} is a random vector that follows p-variate normal distribution $N_p(\boldsymbol{\mu}, \Sigma)$ then the characteristic function of the random vector is given by,

- (A) $\exp[i\mathbf{t}'\boldsymbol{\mu} - (\mathbf{t}'\Sigma\mathbf{t}/2)]$
- (B) $\exp[i\mathbf{t}'\boldsymbol{\mu} + (\mathbf{t}'\Sigma\mathbf{t}/2)]$
- (C) $\exp[i\mathbf{t}'\boldsymbol{\mu} - \mathbf{t}'\Sigma\mathbf{t}]$
- (D) $\exp[\mathbf{t}'\boldsymbol{\mu} - \mathbf{t}'\Sigma\mathbf{t}]$

Correct Option(s): A

English

42.

In Bayesian inference when the prior and the posterior are of the same distribution, the prior is called as

- (A) Non-informative prior
- (B) Improper prior
- (C) Natural Conjugate Prior
- (D) Minimal Information Prior

Correct Option(s): C

English

43.

The joint density function of random variables X, Y are as follows

$$f_{X,Y}(x, y) = e^{-(x+y)}, 0 < x < \infty, 0 < y < \infty$$

then match the following functions of Group A to appropriate value/expression

GROUP A

- (i) $f_X(x)$
- (ii) $P(X > 1)$
- (iii) $P(1 < X+Y < 2)$
- (iv) $\text{Cov}(X, Y)$

GROUP B

- (a) $(1/e) - (2/e^2)$
- (b) $\exp(-x)$
- (c) 0
- (d) $e-1$

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

Correct Option(s): D

English

44.

A discrete random variable X has the following probability distributio

X: 0 1 2 3 4

P(X = x): K 3K 0.2 K 2K + 0.1

then match the following functions of Group A to appropriate value/expression

GROUP A

- (i) Value of K
- (ii) $P(X > 2)$
- (iii) $P(X = 1)$
- (iv) $E(X)$

GROUP B

- (a) 0.4
- (b) 2.2
- (c) 0.1
- (d) 0.3

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

Correct Option(s): B

English

45.

A probability density function is defined as follows:

$$f(x) = \frac{k}{x^{\theta+1}}, x > \alpha, \theta > 1$$
 Then what is the value of k ?

- (A) 1
- (B) $\theta\alpha^\theta$
- (C) θ/α^θ
- (D) $1/\alpha^\theta$

Correct Option(s): B

English

46.

Let X be a random variable such that $P(X = -2) = P(X = -1)$, $P(X = 2) = P(X = 1)$

$P(X > 0) = P(X < 0) = P(X = 0)$, assuming that the random variable takes on $-2, -1, 0, 1$ and 2 then match the following events of Group A to appropriate values in Group B

GROUP A

- (i) $P(X = -2)$
- (ii) $P(X = 0)$
- (iii) $P(X \geq 0)$
- (iv) $P(X \leq 1)$

GROUP B

- (a) $5/6$
- (b) $2/3$
- (c) $1/3$
- (d) $1/6$

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

Correct Option(s): C

English

47.

Which of the following methods is used to measure cyclical fluctuation in a time series?

- (A) Residual Method
- (B) Ratio to Trend Method
- (C) Link Relative Method
- (D) Method of Least Squares

Correct Option(s): A

English

48.

An examination involving multiple choice questions, a student works out the percent questions. In the remaining questions the student guesses the answer. answer is guessed the probability of a correct answer is 0.3. When a student work the probability that it is wrong is 0.1. If the answer to a particular question is correct probability that the student guessed the answer?

- (A) 0.25
- (B) 0.5
- (C) 0.9
- (D) 0.3

Correct Option(s): A

English

49.

The box plot is used to compare _____ of two or more series of data

- (A) Central Value
- (B) Dispersion
- (C) Inter Quartile Range
- (D) All of these

Correct Option(s): D

English

50.

(X_1, X_2, X_3) follows multivariate normal distribution with mean vector $(1, 1, 1)$ and covariance matrix Σ as $\begin{pmatrix} 1 & 1 & 1 \\ 1 & 3 & c \\ 1 & c & 2 \end{pmatrix}$ Then the value of X_2 and $-X_1 + X_2 - X_3$ are independent

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

Correct Option(s): B