



HALDIA INSTITUTE OF TECHNOLOGY

(AN AUTONOMOUS INSTITUTION UNDER MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WEST BENGAL)

Paper Code: BSC 301

Paper Name: Mathematics-III (Probability and Statistics)

Time Allotted: 1 Hour 30 Minutes

Full Marks: 70

The figures in the margin indicate full marks

Candidates are required to give their answers in their own words as far as practicable

Group – A

(Multiple Choice Type Questions)

1. Choose the correct alternatives from the followings:

30 x 1 = 30

(i) A bag contains 7 red and 5 white balls. Two balls are drawn at random. Probability that they are of different colors is [CO2]

(a) $\frac{35}{66}$

(b) $\frac{7}{12}$

(c) $\frac{2}{12}$

(d) None of these

(ii) What is the probability that the sum of the digits on a pair of dice is equal to 8? [CO1]

(a) 0.139

(b) 0.125

(c) 0.25

(d) None of these

(iii) 3 balls are drawn from a bag containing 6 red and 5 black balls. What is the probability of getting the balls are red? [CO2]

(a) $\frac{2}{33}$

(b) $\frac{7}{11}$

(c) $\frac{4}{33}$

(d) $\frac{2}{11}$

(iv) A random variable X has the following p.d.f. $f(x) = e^{-x}, x \geq 0$, then the value of $E(X)$ is [CO2]

(a) 0

(b) 1

(c) 2

(d) -1

(v) If the mean of a distribution is 5, then the value of $E(2X - 9)$ is [CO2]

(a) 10

(b) 1

(c) -4

(d) None of these

(vi) Which one of the following is not true for a distribution function $\Phi(x)$? [CO1]

(a) $\Phi(x)$ is strictly increasing function

(b) $\Phi(\infty) = 1$

(c) $\Phi(-\infty) = 0$

(d) $0 \leq \Phi(x) \leq 1$

(vii) If a random variable X has a Poisson distribution with mean 0.4 then $P(X \leq 1)$ is [CO2]

(a) $e^{-0.4}$,

(b) $1.4 e^{-0.4}$

(c) $1.48 e^{-0.4}$

(d) None of these

(viii) If X has uniform distribution on the interval $[4, 8]$ then the mean of X is [CO2]

(a) $\frac{3}{2}$

(b) 3

(c) 6

(d) 5

(ix) Normal curve of a variate represents the [CO1]

(a) Skewness

(b) Kurtosis

(c) p.d.f.

(d) None of these

(x) If $f(x, y)$ is a two dimensional probability density function (pdf), then [CO1]

(a) $\int_{-\infty}^{\infty} \int_{-\infty}^{\infty} f(x, y) dx dy = 1$

(b) $\int_{-\infty}^{\infty} \int_{-\infty}^{\infty} f(x, y) dx dy = 0$

(c) $\int_{-\infty}^{\infty} f(x, y) = 1$

(d) None of these

(xi) If $f(x, y) = 8xy$, $0 < x < 1$, $0 < y < x$ is a joint probability density function, the marginal density function of X is [CO2]

(a) $4y^3$, $0 < y < 1$

(b) $4x^3$, $0 < x < 1$

(c) $4x^2$, $0 < x < 1$

(d) None of these

(xii) The joint probability density function of two variates X , Y is given by $f(x, y) = \frac{1}{8}(6 - x - y)$ $0 < x < 2$, $2 < y < 4$ then $P(X < 1, Y < 3) = ?$ [CO2]

(a) $\frac{5}{8}$

(b) $\frac{3}{5}$

(c) $\frac{3}{8}$

(d) None of these

(xiii) Correlation coefficient r lies between [CO1]

(a) 0, 1

(b) 0, 2

(c) 1, 2

(d) -1, 1

(xiv) The regression equation of Y on X is $Y = 25.8 + 0.2X$, if $\bar{X} = 50$, then $\bar{Y} = ?$ [CO2]

(a) 25.5

(b) 35.5

(c) 25.8

(d) 35.8

(xv) If the regression coefficient $b_{yx} = 1.4$ then $b_{xy} = ?$ [CO3]

(a) 1

(b) 0.5

(c) 1.3

(d) -1.5

(xvi) A frequency distribution is said to be leptokurtic when [CO1]

(a) $\beta_2 < 3$

(b) $\beta_2 = 3$

(c) $\beta_2 > 3$

(d) $\beta_2 = 2$

(xvii) If Kurtosis has a value less than 3, then the distribution is called[CO1]

(a) Leptokurtic

(b) Mesokurtic

(c) Normal

(d) Platykurtic

(xviii) How many sample can be drawn from a population of size 6, taking sample size 2 if the sampling is SRSWR?[CO2]

(a) 36

(b) 15

(c) 6

(d) None of these

(xix) What is the total number of sampling if a sample of size 2 is drawn from a population of size 10 without replacement?[CO2]

(a) 2

(b) 10

(c) 45

(d) None of these

(xx) The standard deviation of a sample mean for SRSWR is[CO1]

(a) $\sigma^2 / \sqrt{n}$

(b) $\sigma / \sqrt{n}$

(c) σ/n

(d) n

(xxi) The statistics t is said to be an unbiased estimator of a population parameter θ when [CO1]

(a) $E(t) = \theta$

(b) $E(t^2) = \theta$

(c) $E(t^2) = [E(\theta)]^2$

(d) $[E(t)]^2 = [E(\theta)]^2$

(xxii) If $E(T) = 5\theta + 6$, then the unbiased estimator of θ is[CO2]

(a) $\frac{1}{5}T - \frac{6}{5}$

(b) $T - \frac{6}{5}$

(c) $\frac{1}{5}T$ (d) None of these

(xxiii) If sample of mean $\bar{x}$ is drawn from a normal population with mean 5 and s.d. σ then the maximum likelihood estimate of μ is [CO1]

(a) $3\bar{x}$ (b) $\bar{x}$
(c) $2\bar{x}$ (d) None of these

(xxiv) When a true null hypothesis is rejected, the researcher has committed a:[CO1]

(a) Type II error (b) Type I error
(c) Rejection error (d) Error in judgment

(xxv) $H_1(\mu > 60)$ be an alternative hypothesis then the null hypothesis is [CO1]

(a) $H_0(\mu < 60)$ (b) $H_0(\mu \leq 60)$
(c) $H_0(\mu \geq 60)$ (d) None of these

(xxvi) If a null hypothesis is accepted at 0.05 level of significance then this decision is [CO1]

(a) 5% correct (b) 0.05% correct
(c) 0.95% correct (d) 95% correct

(xxvii) In a test of hypothesis if $(-4.6, 6.8)$ is region of acceptance then the Null hypothesis is rejected if the computed value of the test statistic is [CO1]

(a) 5 (b) 6
(c) -3 (d) -6

(xxviii) If $H_0(\sigma = 3)$ be the null hypothesis, then which one of the following is alternative hypothesis [CO1]

(a) $H_1(\sigma = 4)$ (b) $H_1(\sigma = 1)$
(c) $H_1(\sigma = 0)$ (d) $H_1(\sigma \neq 3)$

(xxix) If $b_{YX} = -1.35, b_{XY} = -0.6$ then the value of correlation coefficient is [CO2]

(a) 1 (b) 0.9
(c) -0.9 (d) None of these

(xxx) If X is a Binomial variate with $B\left(2000, \frac{1}{2}\right)$ then $P(|X - 1000| \geq 100) \leq$ [CO2]

(a) $\frac{9}{20}$ (b) $\frac{19}{20}$
(c) $\frac{1}{20}$ (d) None of these

Group – B
(Multiple Choice Type Questions)

2. Choose the correct alternatives from the followings:**20 x 2 = 40**

(i) A speaks the truth in 75% case and B in 80% cases. In what percentage of cases are they likely to contradict each other in stating the same fact?[CO3]

- (a) 45 (b) 35
(c) 0.35 (d) 0

(ii) For a random variable X , $E\{(X - 1)^2\} = 10$ and $E\{(X - 2)^2\} = 6$, then $E(X) = ?$ [CO2]

- (a) $\frac{3}{4}$ (b) $\frac{1}{4}$
(c) $\frac{7}{2}$ (d) $\frac{1}{2}$

(iii) If X is Poisson variable such that $P(X = 1) = P(X = 2) = 0.2$ then the mean of Poisson distribution is [CO2]

- (a) 1 (b) 2
(c) 8 (d) 0

(iv) The following table gives the joint distribution of X and Y

$X \ Y$	0	1	2
1	0.3	0.2	0.1
2	0.1	0	0.3

Then $E(XY) = ?$ [CO2]

- (a) 3.2 (b) -1.6
(c) 1.6 (d) None of these

(v) The regression equation of Y on X is $X + 3Y - 116 = 0$, variance of X and Y are 9 and 4 respectively, Find the correlation coefficient. [CO2]

- (a) -0.5 (b) 0.6
(c) 0.5 (d) None of these

(vi) The first four raw moments of a distribution are 1, 4, 10 and 46 respectively. Then the third central moment is [CO2]

- (a) 1 (b) 3
(c) 4 (d) -1

(vii) The s.d. of a population of size 112 is 13.2 then the s.d. of a sample of size 10 taken without replacement is [CO2]

- (a) 1 (b) 0
(c) 2 (d) None of these

(viii) If T_1, T_2 be statistics with expectation $E(T_1) = 2\theta_1 + 3\theta_2$ and $E(T_2) = \theta_1 + \theta_2$ then the unbiased estimate of the parameter θ_1 is [CO2]

- (a) $3T_2 + 2T_1$ (b) $T_2 + 2T_1$
(c) $T_2 - 2T_1$ (d) None of these

(ix) In a test of hypothesis if $z = \frac{\bar{x} - 1800}{14.14}$ be the test statistic where $\bar{x}$ is the sample mean and if $z > 2.33$ be the critical region then the null hypothesis is accepted if the mean of the drawn sample be [CO2]

- (a) 1850 (b) 1700
(c) 1900 (d) 1820

(x) In order to test whether a coin is perfect the coin is tossed 5 times. The null hypothesis of perfectness is rejected if more than 4 heads are obtained. What is the probability of type-I error? [CO2]

(a) $\frac{1}{32}$

(b) $\frac{13}{32}$

(c) $\frac{1}{2}$

(d) None of these

(xi) There are two identical urns containing respectively 4 white, 3 red balls and 3 white, 7 red balls. An urn is chosen at random and a ball is drawn from it. What is the probability that the ball is white? [CO3]

(a) $\frac{3}{10}$

(b) $\frac{7}{10}$

(c) $\frac{61}{140}$

(d) None of these

(xii) A special unbiased die with $n + 1$ faces is rolled. Its faces are marked by the numbers $0, \frac{1}{n}, \frac{2}{n}, \dots, \frac{n-1}{n}, \frac{n}{n}$. If X denotes the number shown then what is $E(X)$? [CO3]

(a) $\frac{1}{n}$

(b) $\frac{1}{2}$

(c) $\frac{n+2}{12n}$

(d) 1

(xiii) If a random variable X follows normal distribution with mean μ and S.D. σ such that $P(9.6 \leq X \leq 13.6) = 0.7008$ and $P(X \geq 9.6) = 0.8159$ where $\phi(0.9) = 0.8159, \phi(1.2) = 0.8849$, then $\mu = ?$ [CO3]

(a) 9.6

(b) 11.2

(c) -9.6

(d) None of these

(xiv) The joint pdf of a bivariate (X, Y) is $f(x, y) = e^{-(x+y)}, x \geq 0, y \geq 0$. Then marginal pdf of X is [CO2]

(a) $e^{-y}, y \geq 0$

(b) $e^{-(x+y)}, x \geq 0, y \geq 0$

(c) $e^{-x}, y \geq 0$

(d) None of these

(xv) If $x = 4y + 5$ and $y = kx + 4$ be two regression lines of x on y and of y on x respectively then k lies in the interval [CO2]

(a) (1, 2)

(b) $\left(0, \frac{1}{4}\right)$

(c) $\left[0, \frac{1}{4}\right]$

(d) None of these

(xvi) The first two moments about 3 are 2, 10 then the variance is [CO2]

(a) 25

(b) 31

(c) 6

(d) None of these

(xvii) The mean weight of 500 ball bearing is 5.02 gm. Their S. D. is 0.30 gm. What is the Sample s.d. for a random sample of 100 ball bearing? [CO3]

(a) 0.27

(b) 0.027

(c) 5.10

(d) None of these

(xviii) What is the size of the sample if s.d. of the population is 9 and there should be 99% confidence that the error of estimate will not exceed 3. Given $\int_0^{2.58} \phi(z) dz = 0.495$ [CO2]

(a) 90

(b) 30

(c) 59

(d) 60

(xix) Two random samples of 600 and 1000 persons of two cities are selected respectively. It is found that 400 and 600 persons are literate among the persons in the two samples respectively. To test the populations of the two cities have same percentage of literacy or not at 5% level of significance what is the test statistic? [CO3]

(a) 2.58

(b) 2.66

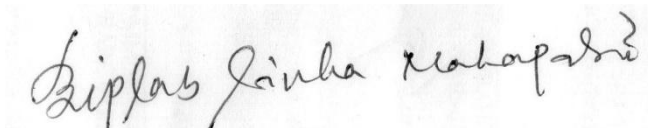
(c) 1.96

(d) None of these

(xx) A random samples of size 400 is drawn from a normal population with mean 171.38 where population s.d. is 3.30. To test the population mean 171.17 what will be the test statistic ?[CO3]

(a) 2.58
© -1.27

(b) 1.27
(d) None of these



Signature of the Paper Setter/Moderator

Answer Key:

Group – A

1. (i) a	(ii) a	(iii) c	(iv) b	(v) b	(vi) a
(vii) b	(viii) c	(ix) c	(x) a	(xi) b	(xii) c
(xiii) d	(xiv) d	(xv) b	(xvi) c	(xvii) d	(xviii) a
(xix) c	(xx) b	(xxi) a	(xxii) a	(xxiii) b	(xxiv) b
(xxv) d	(xxvi) d	(xxvii) d	(xxviii) d	(xxix) c	(xxx) c

Group – B

2. (i) b	(ii) c	(iii) b	(iv) c	(v) a	(vi) b
(vii) d	(viii) d	(ix) d	(x) a	(xi) c	(xii) b
(xiii) d	(xiv) d	(xv) c	(xvi) c	(xvii) b	(xviii) d
(xix) b	(xx) b				