

DO NOT OPEN THIS TEST BOOKLET UNTIL YOU ARE ASKED TO DO SO

TEST BOOKLET

Sl. No.

0256

Subject Code : 26

Subject : Statistics

LECTURERS FOR NON-GOVT. AIDED COLLEGES OF ODISHA

Time Allowed : 2 Hours

Maximum Marks : 150

: INSTRUCTIONS TO CANDIDATES :

1. IMMEDIATELY AFTER THE COMMENCEMENT OF THE EXAMINATION, YOU SHOULD CHECK THAT THIS TEST BOOKLET CONTAINS 24 PAGES AND DOES NOT HAVE ANY UNPRINTED OR TORN OR MISSING PAGES OR ITEMS ETC. IF SO, GET IT REPLACED BY A COMPLETE TEST BOOKLET.
2. You have to enter your **Roll No.** on the Test Booklet in the Box provided alongside. DO NOT write anything else on the Test Booklet.

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3. The Test Booklet contains **100** questions. Each question comprises four answers. You have to select the correct answer which you want to mark (darken) on the **Answer Sheet (OMR Sheet)**. In any case choose **ONLY ONE** answer for each question. If more than one answer is darkened, it will be considered as wrong.
4. You have to mark (darken) all your answers only on the **OMR Answer Sheet using BLACK BALL POINT PEN** provided by the State Selection Board. You have to do rough work only in the space provided at the end of the Test Booklet. See instructions in the Answer Sheet.
5. All questions carry equal marks i.e. of one and half mark for each correct answer and each wrong answer will result in negative marking of **0.50** mark.
6. Before you proceed to mark (darken) the answers in the **OMR Answer Sheet** to the questions in the Test Booklet, you have to fill in some particulars in the Answer Sheet as per the instructions in your Admit Card.
7. On completion of the examination, you should hand over the **original Answer Sheet (OMR Sheet)** issued to you to the Invigilator before leaving the Examination Hall. You are allowed to take with you the candidate's copy (carbon copy) of the **OMR Answer Sheet** along with the Test Booklet for your reference.

SEAL

Candidate's full signature

Invigilator's signature

IW-18/9

2021

(Turn over)

1. The sum of two positive quantities is $2n$. Find the chance that the product of the two quantities is not less than $\frac{3}{4}$ times their greatest product :
- (A) 0.30
(B) 0.50
(C) 0.25
(D) 0.45
2. The probability that a teacher will give an unannounced test during any class meeting is 0.2. If a student is absent twice, what is the probability that he will miss at least one test ?
- (A) 0.64
(B) 0.80
(C) 0.60
(D) 0.36
3. Company A produces 10% defective products, company B produces 20% defective products and company C produces 5% defective products. If choosing a company is an equally likely event, then find the probability that the product chosen is defective :
- (A) 0.22
(B) 0.12
(C) 0.10
(D) 0.21
4. A survey determines that in a locality, 33% go to work by bike, 42% go by car, and 12% use both. The probability that a random person selected uses neither of them is :
- (A) 0.39
(B) 0.37
(C) 0.63
(D) 0.75
5. At a certain university, 4% of men are over 6 feet tall and 1% of women are over 6 feet tall. The total student population is divided in the ratio 3 : 2 in favour of women. If a student is selected at random from among all those over six feet tall, what is the probability that the student is a woman ?
- (A) $\frac{8}{11}$
(B) $\frac{3}{5}$
(C) $\frac{3}{11}$
(D) $\frac{1}{20}$

6. For some constant c , the random variable X has probability density function :

$$f(x) = \begin{cases} cx^n, & 0 < x < 1 \\ 0, & \text{otherwise} \end{cases}$$

Find $P(X > x)$.

- (A) $x^{n+1} - 1$
 (B) x^{n+1}
 (C) 1
 (D) $1 - x^{n+1}$
7. If a random variable X has the density function

$$f(x) = \begin{cases} \frac{1}{2}e^{-|x|}, & -\infty < x < \infty \\ 0, & \text{otherwise} \end{cases}$$

the distribution function is given by :

(A) $F(x) = \begin{cases} \frac{e^x}{2}, & x \leq 0 \\ 1 - \frac{e^x}{2}, & x > 0 \end{cases}$

(B) $F(x) = \begin{cases} \frac{e^x}{2}, & x \leq 0 \\ 1 - \frac{e^{-x}}{2}, & x > 0 \end{cases}$

(C) $F(x) = \begin{cases} 1 - \frac{e^{-x}}{2}, & 0 < x < \infty \\ 1, & \text{otherwise} \end{cases}$

(D) $F(x) = \begin{cases} 1 - \frac{e^x}{2}, & x < 0 \\ \frac{e^{-x}}{2}, & x \geq 0 \end{cases}$

8. Pick out the correct relation among different modes of convergence of a sequence of random variables :

- (A) Convergence almost surely \Rightarrow convergence in distribution \Rightarrow convergence in probability
 (B) Convergence in r -th mean \Rightarrow convergence almost surely \Rightarrow convergence in probability
 (C) Convergence in probability \Rightarrow convergence in r -th mean \Rightarrow convergence in distribution
 (D) Convergence in r -th mean \Rightarrow convergence in probability \Rightarrow convergence in distribution

9. Let $\{X_n\}$ be a sequence of independent random variables with $E(X_k) = \mu_k$ and $V(X_k) = \sigma_k^2$. Then,

$$\lim_{n \rightarrow \infty} \frac{1}{n^2} \sum_{k=1}^n \sigma_k^2 \rightarrow 0 \Rightarrow \frac{\sum_{k=1}^n X_k - \sum_{k=1}^n \mu_k}{n} \xrightarrow{P} 0$$

This theorem is called :

- (A) Bernoulli's theorem on WLLN
 (B) Khinchin's theorem on WLLN
 (C) Chebyshev's theorem on WLLN
 (D) Poisson's theorem on WLLN

10. Lindeberg-Levy Central Limit Theorem assumes that the sequence of random variables under consideration are :

- (A) i.i.d. with a common mean and a common variance ($< \infty$)
- (B) i.i.d. Bernoulli variables with common parameter p
- (C) independent with different means and different variances ($< \infty$)
- (D) independent and their third and higher order moments exist

11. Find the moment generating function of X if its probability density function is

$$f(x) = \begin{cases} x & \text{for } 0 < x < 1 \\ 2 - x & \text{for } 1 < x < 2 \end{cases}$$

(A) $\left(\frac{e^{-t} - 1}{t}\right)^2$

(B) $\left(\frac{e^t - 1}{t}\right)^2$

(C) $\left(\frac{e^{2t} - 1}{t}\right)^2$

(D) $\frac{e^{2t} - 1}{t^2}$

12. Let X and Y be jointly distributed continuous random variables with joint probability density function

$$f(x, y) = \begin{cases} 6e^{-(2x+3y)}, & x, y \geq 0 \\ 0, & \text{otherwise} \end{cases}$$

Find $E(Y|X > 2)$:

(A) $\frac{1}{3}$

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

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

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

13. If a binomial variate has mean 4 and variance 3, find its third central moment μ_3 :

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

(B) $\frac{5}{2}$

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

(D) $\frac{3}{4}$

14. If $X \sim N(\mu, \sigma^2)$, find variance of

$$\frac{1}{2} \left(\frac{X - \mu}{\sigma} \right)^2 :$$

(A) $\frac{1}{4}$

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

(C) 1

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

15. If a random variable X has a beta distribution of the first kind with parameters $m > 1$ and $n > 1$, the mode lies at the point :

(A) $\frac{m}{m+n-2}$

(B) $\frac{m-1}{m+n-1}$

(C) $\frac{m-1}{m+n-2}$

(D) $\frac{m}{m+n}$

16. The life time (X) in hours of a certain electrical equipment has a normal distribution with mean 80. However, experience shows that life times of approximately 99% of the said equipment lie in the interval $[68, 92]$. Find variance of X :

(A) 25

(B) 36

(C) 144

(D) 16

17. Which one is not a condition of a Poisson model with probability of having success p ?

(A) p in a small time interval is constant

(B) p more than one in a small time interval is very small

(C) p in a small time interval is independent of time and also of earlier success

(D) p in a small time interval $(t, t + dt)$ is kdt for a positive constant k

18. Buses arrive at a specified stop at 15 minutes intervals starting at 7 AM. If a passenger arrives at the stop at a time that is uniformly distributed between 7 and 7:30, find the probability that he waits less than 5 minutes for a bus :

(A) $\frac{1}{6}$

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

(C) $\frac{1}{3}$

(D) $\frac{3}{4}$

19. Find the variance of the number of times one must throw a die until the outcome 1 has occurred 4 times :

- (A) 144
- (B) 120
- (C) 124
- (D) 96

20. If X and Y have a bivariate normal distribution with means $\mu_X = 12$, $\mu_Y = 10$; standard deviations $\sigma_X = 30$, $\sigma_Y = 20$ and correlation coefficient $\rho = 0.8$, find $E(X|Y = 9)$:

- (A) 12.00
- (B) 10.80
- (C) 13.20
- (D) 12.53

21. For the frequency distribution with classes of unequal widths, the heights of bars of the histogram are proportional to :

- (A) Frequencies in percentage
- (B) Class intervals
- (C) Frequency densities
- (D) Class frequencies

22. The suitable graph to represent the time series data is :

- (A) Histogram

- (B) Histogram
- (C) Frequency curve
- (D) Frequency polygon

23. _____ curve is used to study disparities of the distributions of income and wealth for certain segment of a population.

- (A) Ogive curve
- (B) Frequency curve
- (C) Range curve
- (D) Lorenz curve

24. 120 students appeared for a certain test and the following marks distribution was obtained. If 35 marks are required for passing, find an approximate number of failed students :

Marks	Students
0 – 20	10
20 – 40	30
40 – 60	36
60 – 80	30
80 – 100	14

- (A) 33
- (B) 17
- (C) 41
- (D) 35

25. Karl Pearson's coefficient of skewness of a distribution is +0.40 whose mean and standard deviations are 30 and 8 respectively. Find the mode of the distribution :

- (A) 28.9
- (B) 26.8
- (C) 21.8
- (D) 18.5

26. The first three moments of a distribution about value 1 are 2, 25 and 80 respectively. Find variance and μ_3 :

- (A) 21 and - 54
- (B) 21 and - 30
- (C) 16 and - 71
- (D) 25 and - 44

27. Arithmetic and harmonic means of x_i , $i = 1, 2, \dots, n$, are \bar{x} and h respectively. Then the harmonic mean H_u of $u_i =$

$\frac{1}{\delta x_i}$, $i = 1, 2, \dots, n$, is given by :

- (A) $H_u = \frac{1}{\delta h}$
- (B) $H_u = \frac{1}{\delta} \bar{x}$

(C) $H_u = \frac{1}{\delta \bar{x}}$

(D) $H_u = \frac{\delta}{h}$

28. The first normal equation, for fitting a curve of the type $y = ab^x$ to a data set (x_i, y_i) , $i = 1, 2, \dots, n$ by the least squares method, is $\sum \log y = n \log a + \log b \sum x$. The second equation is :

- (A) $\sum x \log y = \log a \sum x + \log b \sum x^2$
- (B) $\sum x \log y = \log a \sum x + \log b (\sum x)^2$
- (C) $\sum x^2 \log y = \log a \sum x + \log b (\sum x)^2$
- (D) $\sum x^2 \log y = \log a \sum x \log y + \log b \sum x \sum \log y$

29. In a very hotly fought battle, at least 70% of the combatants lost an eye, at least 75% lost an ear, at least 80% an arm and at least 85% a leg. Find at least what percentage of combatants lost all four :

- (A) 17%
- (B) 19%
- (C) 15%
- (D) 10%

30. If X and Y are two correlated variables having the same standard deviation σ and the correlation coefficient ρ , then the correlation coefficient between X and X + Y is :

(A) $\frac{1}{\sqrt{1+\rho^2}}$

(B) $\frac{\sigma}{\sqrt{2(1+\rho)}}$

(C) $\sqrt{\frac{1+\rho}{2}}$

(D) $\frac{\sqrt{1+\rho}}{2\sigma}$

31. The two regression equations of Y on X and X on Y are $Y = \theta X + 4$ and $X = 4Y + 5$ respectively. A plausible interval for θ is :

(A) (0, 0.25)

(B) (0, 0.50)

(C) (0.20, 1.0)

(D) (0, 1.0)

32. The coefficient of rank correlation of the marks obtained by 10 students in two subjects was 0.4. But, later it was found that the difference in ranks for one student was wrongly taken as 2 instead of 3. Find the correct coefficient of rank correlation :

(A) 0.43

(B) 0.37

(C) 0.52

(D) 0.25

33. For a trivariate distribution in X_1, X_2 and X_3 , all the total correlation coefficient between the variables are equal, say α . If $R_{1,23}$ is the multiple correlation coefficient of X_1 on X_2 and X_3 , then $1 - R_{1,23}^2$ is equal to :

(A) $(1 - \alpha)(1 + 2\alpha) / (1 + \alpha)$

(B) $[(1 + \alpha) - (1 - \alpha)(1 + 2\alpha)] / (1 + \alpha)$

(C) $(1 - \alpha)(1 - 2\alpha) / (1 + \alpha)$

(D) $(1 + \alpha)(1 - 2\alpha) / (1 - \alpha)$

34. If ρ and η are respectively the correlation coefficient and correlation ratio while dealing with two variables X and Y, then which one of the following statement is not true ?

(A) η is an appropriate measure of curvilinear relationship between the variables

(B) When both variables are dichotomous, η is more suitable than ρ to measure association between them

(C) $1 - \eta^2 \leq 1 - \rho^2$

(D) The value of η is not independent of the classification of data on the variables

35. When a random sample x_1, x_2, \dots, x_n is taken from a normal population $N(\mu, \sigma^2)$, the variance of the sample variance $s^2 = \frac{1}{n} \sum_{i=1}^n (x_i - \bar{x})^2$ is :
- (A) $2\sigma^2/n$
 (B) $\sigma^2/2n$
 (C) $2\sigma^4/n$
 (D) σ^4/n^2
36. If X and Y are independent χ^2 variates with 6 and 8 degrees of freedom, then X/Y is a :
- (A) $\beta_1(3, 4)$ variate
 (B) χ^2 variate with 14 degrees of freedom
 (C) F(5, 7) variate
 (D) $\beta_2(3, 4)$ variate
37. For $4 < n < 30$, the t-distribution curve with regard to flatness is :
- (A) Mesokurtic
 (B) Bimodal
 (C) Leptokurtic
 (D) Platykurtic
38. The modal value of a F-distribution with $(8, v_2)$ degrees of freedom is $7/12$. Compute v_2 .
- (A) 5
 (B) 7
 (C) 11
 (D) 10
39. If χ_n^2 is a chi-square variate with n degrees of freedom, then $\sqrt{\chi_n^2}$ will be distributed as a :
- (A) Chi-square distribution
 (B) Exponential distribution
 (C) Gamma distribution
 (D) Fisher's t-distribution
40. If X has a F-distribution with (m, n) degrees of freedom, then the distribution of 1/X will be :
- (A) t-distribution with n degree of freedom
 (B) F-distribution with $\left(\frac{n}{2}, \frac{m}{2}\right)$ degrees of freedom
 (C) F-distribution with (n, m) degrees of freedom
 (D) Chi-square distribution with m degree of freedom