2025

STATISTICS

Full Marks : 100

Pass Marks : 33

Time : Three hours

Attempt all Questions.

The figures in the right margin indicate full marks for the questions.

For Question Nos. 1 to 10, choose the correct answer and rewrite.

1. In tossing three coins at a time, the probability of getting atmost one head is : 1

(A) $\frac{3}{8}$ (B) $\frac{7}{8}$

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

2. Three horses A, B and C are in a race. A is twice as likely to win as B and B is likely to win as C. The probability of winning the horse A is : 1

(A) $\frac{1}{7}$ (B) $\frac{2}{7}$

(C) $\frac{3}{7}$ (D) $\frac{4}{7}$

3. For $U_0 = 3$, $U_1 = 12$, $U_2 = 81$, $U_3 = 200$, $U_4 = 100$, then the value of $\Delta^5 U_0$ is : 1

(A) -259 (B) 496

(C) 0 (D) 1

4. The value of $E^2 (\sin x)$ at interval of differences 2 is : 1

(A) $\cos (x + 4)$ (B) $\cos (x + 2)$

(C) $\sin (x + 2)$ (D) $\sin (x + 4)$

5. A curve is drawn to pass through the points given by the following data :

x :	1	2	3	4	5
f(x) :	2	2.4	2.7	2.9	3

The estimated area bounded by the curve, x-axis and lines $x = 1$, $x = 5$ using Trapezoidal's rule is 1

(A) 10.5 (B) 10

(C) 9.5 (D) 9

6. If $X \sim P(2)$, the mean of the distribution is : 1

(A) 2 (B) 4

(C) 6 (D) 8

7. For two attributes A and B, if $(AB) = 25$, $(A\beta) = 20$, $(\alpha B) = 10$, $(\alpha\beta) = 15$, then the value of N is : 1

(A) 25 (B) 45

(C) 50 (D) 70

8. If $(\alpha) = 600$, $(\beta) = 50$, $(\alpha\beta) = 20$, $N = 1000$, then the attributes are : 1

(A) independent (B) positively associated

(C) negatively associated (D) no conclusion

9. If S^2x and S^2y are the unbaised estimates of common population variance σ^2 of two independent samples of sizes 10 and 12, then the degrees of freedom of F distribution for testing the equality of population variances when $S^2x < S^2y$ is : 1

(A) (9, 11) (B) (10, 11)

(C) (9, 12) (D) (11, 9)

10. Complete count of the heads of people of a country is known as : 1

(A) census (B) vital statistics

(C) demography (D) sample survey

11. Write the range of probability of an event. 1

12. If $E(x) = 5$ and $E(y) = 7$ such that x and y are independent, calculate $E(xy)$. 1

13. Write one advantage of using interpolation techniques. 1

14. Using Simpson's $\frac{3}{8}$th rule of numerical integration, the value of $\int_{-3}^{3} x^2 dx$ is 18.

Obtain the error of estimate from exact value. 1

15. Write the probability distribution function of a random variable X which follows a normal distribution with mean (μ) and variance (σ^2). 1

16. Examine the consistency of the following data :

$N = 100$, $(A) = 60$, $(B) = 50$, $(A\,B) = 5$, the symbols have their usual meaning. 1

17. Define level of significance. 1

18. Find the degrees of freedom for χ^2 - test statistic in case of contingency table of order 2×2. 1

19. Define crude death rate. 1

20. Rewrite correct statement :

"In life table, nPx is the probability that a person aged 'x' dies at the age of 'x+n'." 1

21. Given that $P(A) = \frac{1}{3}, P(B) = \frac{1}{4}, P(A/B) = \frac{1}{6}$, find the probability P(B/A). 2

22.. Estimate U_2 given that $U_1 = 7$ and $U_3 = 13$ using Δ and E operations. 2

23. If $X \sim N(\mu, \sigma^2)$, approximately represent $P(X < 30) = 0.1$ and $P(X \geq 80) = 0.05$ in a single diagram. 2

24. Define positive and negative classes in the theory of attributes. 2

25. Draw the curve of t-distribution at α - level of significance for two-tailed test showing the regions of acceptance and rejection. 2

26. Write any two methods of obtaining vital statistics. 2

27. For the given data below, compute the total fertility rate : 2

Age Group (in year)	Female Population	Total Births
20 - 24	30,000	15,000
25 - 29	24,000	12,000
30 - 34	20,000	6,000
35 - 39	16,000	3,000

28. Estimate the standardised death rates for the two countries A and B from the data given below and compare the results : 2

$$\sum P_x^S = 1000, \sum m_x^a P_x^S = 7372 \text{ and } \sum m_x^b P_x^S = 4700$$

(The symbols have their own meanings.)

29. p is the probaility that a man aged 'x' years will die in a year. Out of two men A and B each aged x years, find the probability that A will die in a year and will be the first to die. 4

30. (a) One shot is fired from each of the three guns A, B and C independently. If the chances that the target is hit by A, B and C guns are 0.5, 0.6 and 0.8 respectively, what is the probability that at least two hits are registered? 4

Or

(b) Two unbaised dice are thrown. Find the expected values of the sum of numbers of points on them. 4

31. (a) Given that $\sum_{1}^{7} U_x = 100$, $\sum_{4}^{7} U_x = 49$, $U_7 = 16$, find U_1 by using Newton's forward interpretation formula. 4

Or

(b) Given the following data, find the value of y when x = 7 by using Newton's backward interpretation formula. 4

x:	0	2	4	6	8
y:	66	81	93	101	106

32. What is meant by numerical integration? Write the general quadrature formula for equidistant ordinates. 4

33. (a) Evaluate $\log_e 7$ by Simpson's $\frac{1}{3}$rd rule from the integral $\int_0^6 \frac{1}{1+x} dx$. 4

Or

(b) Evaluate $\int_1^7 2x^2 dx$ by using Simpson's three-eighth rule for numerical integration. 4

34. (a) Given the following ultimate class frequencies, find the frequencies of positive classes: 4

$(ABC) = 150$, $(AB\gamma) = 740$, $(A\beta C) = 220$

$(A\beta\gamma) = 1200$, $(\alpha BC) = 200$, $(\alpha B\gamma) = 1760$

$(\alpha\beta C) = 170$, $(\alpha\beta\gamma) = 21800$.

Or

(b) In a series of houses actually invaded by smallpox 60% of the inhabitants are attacked and 70% have been vaccinated. Find the lowest percentage of the vaccinated that must have been attacked. 4

35. (a) Two random samples gave the following results :

Sample	Size	Sample mean	Sum of squares of deviations from their means
1	10	15	90
2	12	14	108

Test whether the population variances are significantly different.
{Given : $F_{0.05}(11,9) = 3.10$ (approx), $F_{0.05}(9,11) = 2.90$} 4

Or

(b) A certain stimulus administered to each of the 12 patients resulted in the following increase of blood pressure :

5, 2, 8, –1, 3, 0, –2, 1, 5, 0, 4 and 6

Can it be concluded that the stimulus will, in general, be accompanied by an increase in blood pressure? (Give : $t_{0.05}$ for one-tailed test at 11 d – f = 1.80) 4

36. (a) State and prove additive law of probability. 6

Or

(b) State and prove addition theorem of expectation. 6

37. (a) Construct the forward difference table for the equation $y = 2x^3 - x^2 + 3x + 1$ corresponding to $x = 0, 1, 2, 3, 4$ and 5. 6

Or

(b) Using Lagrange's interpolation formula, find the form of the function $y = f(x)$ given that 6

x :	0	2	3	6
f(x) :	36	16	18	72

38. (a) A and B play a game in which their chances of winning are in the 3:2. Out of 5 games played, calculate A's chance of winning

(i) exactly 3 games;

(ii) at most 2 games. 6

Or

(b) A car hire firm has two cars, which it hires out day by day. The number of demands for a car on each day is distributed as Poison distribution with mean 2. Calculate the proportion of days on which 6

(i) neither car is used;

(ii) only one car is used.

39. (a) Among the adult population of a certain town, 60% are males, 50% are wage earners and 40% are 45 years and above, 10% of the males are not wage-earners and 40% of the males are under 45. Make the best possible inference about the limits within which the percentage of persons of 45 years or above are wage-earners. 6

Or

(b) 800 candidates of both sexes appeared at an examination. The boys out-numbered the girls by 15% of the total. The number of candidates who passed exceed the number failed by 480.
Equal number of boys and girls failed in the examination.

Prepare a 2×2 table and make the inference about the Yule's coefficient of association. 6

40. The demand for a particular spare part in a factory was found to vary from day-to-day. In a sample study, the following information was obtained : 6

Days :	Mon	Tue	Wed	Thu	Fri	Sat
No. of parts demanded :	498	499	511	502	500	490

Test the null hypothesis that the number of parts demanded does not depend on the day of the weak.
(Given : $X^2_{0.05}$ =11.07 at 5d.f)

41. Given the following table for lx, the number of rabbits living at age x, compute the life table for rabbits : 6

x:	0	1	2	3	4	5	6
lx:	100	90	80	75	60	30	0

Calculate the column of dx, qx and L_x only.
