52 Sts 21/26

2026

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 12, choose the correct answer and write the Sl. No. of the correct alternative.

1. When A and B are events which are not mutually exclusive, $P(A \cap B)$ is equal to – 1

(A) $P(A)+P(B)$

(B) $P(A)+P(B)-P(A \cap B)$

(C) $P(A)\,P(B)$

(D) None of the above

2. A and B are two mutually exclusive events such that $P(A)=0.3$, $P(B)=k$ and $P(A \cup B)=0.5$ the value of k is – 1

(A) 0.2

(B) 0.3

(C) 0.5

(D) 0.8

3. $\Delta(x^2+1)$ is equal to – 1

(A) $2x-1$

(B) $2x+1$

(C) $x+1$

(D) $2x$

P.T.O.

4. The most suitable numerical method to find the value of $\int_1^9 (2x^2 + 3)\,dx$ to use – 1

(A) Trapezoidal Rule
(B) Simpson's one-third Rule
(C) Simpson's three-eighth Rule
(D) None of the above

5. If X~B (25, 0.8) the standard deviation of X is – 1

(A) 20
(B) 10
(C) 4
(D) 2

6. With three attributes A, B, and C the total number of ultimate class frequencies is – 1

(A) 2^2
(B) 3^2
(C) 2^3
(D) 3^3

7. The test statistic used to test the equality of means of two normal populations based on small samples is – 1

(A) t- statistic
(B) Z- statistic
(C) F -statistic
(D) χ^2 - statistic

8. In testing the equality of the means of two populations based on samples of sizes 8 and 10 separately drawn from two normal populations, the degree of freedom of the test statistic, is – 1

(A) 18
(B) 17
(C) 16
(D) None of the above

9. Vital statistics deals with – 1

(A) births
(B) deaths
(C) marriages
(D) all the above

10. The number of male population and female population of town are 2000000 and 1800000 respectively. The sex ratio of the town is – 1

(A) $\frac{10}{9}$ (B) $\frac{10000}{9}$

(C) 0.9 (D) 900

Directions for Question Nos. 11 and 12, each of these questions contains two statements Assertion(A) and Reason(R). You have to write the code of the correct alternatives A, B, C,and D given below :

(A) Both (A) and (R) are true and (R) is a correct explanation of (A)

(B) Both (A) and (R) are true and (R) is not a correct explanation of (A)

(C) (A) is true but (R) is false

(D) (A) is false but (R) is true

11. Assertion(A) : If A and B are independent, $P(A \cap B) = P(A), P(B)$ 1

Reason(R) : For the two events A and B, P (A) > 0, P (B) > 0 and two events cannot be mutually disjoint

12. Assertion(A) : For a Poisson distribution, mean = variance 1

Reason(R) : Poisson distribution is a particular case of Normal distribution

13. Find $E\left(e^{x+1}\right)$ 1

14. Write a polynomial in variable x, whose second order finite difference is constant. 1

15. Define numerical integration. 1

16. Simpson's one-third rule of numerical integration is wrongly written as

$$\int_{x_0}^{x_n} f(x)\,dx=\frac{h}{3}\left[(y_0+y_n)+4\left(y_2+y_4+y_6+\ldots\ldots\ldots+y_{n-2}\right)+\ldots\ldots\ldots+2\left(y_1+y_3+\ldots\ldots\ldots+y_{n-1}\right)\right]$$

Write the correct formula. 1

17. The value of the definite integral $\int_0^{\pi/2} \sin x\,dx$, by using Simpson's one-third rule is 1.0006 while its exact value is 1. Comment on the reason for the observed difference. 1

18. Test whether the attributes A and B are independent in the following case :

$(AB)=50,(\alpha B)=25,(A\beta)=48,(\alpha\beta)=24$ 1

19. Define an unbiased estimator. 1

20. What is a stationary population? 1

21. Find n, if ${}^{n}P_2 = 12$ 2

22. (a) Construct the forward difference table for the following table with arguments, x and corresponding entries, y : 2

x:	2	4	6	8
$y=f(x)$	6	9	13	19

OR

(b) Show that $f(4) = f(3) + \Delta f(2) + \Delta^2 f(2)$, interval of differencing being unity. 2

23. Draw a rough curve of $f(x) = x^2$ on a Cartesian plane and shade the region whose area is given by the value of $\int_1^3 x^2\,dx$. 2

24. Derive the recurrence relation for probabilities of a Poisson distribution. 2

25. The variable X is normally distributed with mean 10 and variance 25. Draw and shade the area from normal probabilities curve when $P(5 \leq X \leq 12)$. 2

26. In a life table $l_6 = 98700$ & $d_6 = 600$. Calculate l_7 & p_6 of the life table. 2

27. (a) Balls numbered 1, 2, 3, 4 and 5 are put into a bag . Two balls are drawn from the bag. Find the probability that the sum of numbers on these balls is 5. 3

OR

(b) Find the probability that a leap year selected at random contains 53 Wednesdays. 3

28. (a) Complete the following contingency table for two attributes A and B :

	A	α	Total
B	300		500
β			
Total	550		900

And comment on consistency of the data. 3

OR

(b) Prepare a 2 × 2 contingency table of the data : 3

$N = 500, (A) = 250, (B) = 180, (\alpha\beta) = 26, (AB) = 60$

29. The sum of squares of sample observations from the sample mean of a sample of size 10 is 225. Calculate the unbiased estimate of standard deviation of the population. 3

30. Two random samples of sizes 6 and 7are drawn from two normal populations and the values of unbiased estimates of common population variance are obtained as 13.2 and 15.3 respectively.

Test whether the populations have the same variance :

[given $F_{0.05}, (6,5)\ d.f. = 4.95$, $F_{0.05,(5,6)d.f.} = 4.39$] 3

31. (a) Show that the 3rd order difference of a 3rd degree polynomial in x is a constant. 4

OR

(b) Prove $e^x = \left(\frac{\Delta^2}{E}\right) e^x \cdot \frac{Ee^x}{\Delta^2 e^x}$ that the interval of differencing being h. 4

32. Evaluate $\int_0^3 x^3 dx$, by a suitable numerical integration method. 4

33. If 2% of electric bulbs manufactured by a certain company are defective. Find the probability that in a sample of 100 bulbs, less than 2 bulbs are defective

$e^{-1} = 0.3679$, $e^{-2} = 0.1353$, $e^{-3} = 0.0498$, $e^{-4} = 0.0183$ 4

34. (a) To evaluate the effectiveness of a vaccine for Covid-19 disease a survey was conducted on their status of vaccination and covid-19 disease. The data could be obtained from 1500 persons in the village. 360 people in all reported to have been infected with Covid-19. 340 had been vaccinated and of these only 20 had been infected. Find Yule's coefficient of association to test the effectiveness of the vaccine. 4

OR

(b) In a survey conducted in a town information on three attributes of the persons under survey were obtained. A denotes the attribute that the person is a vegetarian, B denotes the attribute that the person is alcoholic and C denotes the attribute that the person is a smoker and the following class frequencies were obtained :

$(ABC) = 149$, $(AB\gamma) = 738$, $(A\beta C) = 225$, $(A\beta C) = 1196$,

$(\alpha BC) = 204$, $(\alpha B\gamma) = 1762$, $(\alpha\beta C) = 171$ and $(\alpha\beta\gamma) = 21842$

Find the class frequencies (A), (B), (AB) and N. 4

35. Calculate the crude death rate for males and females from the following data : 4

Age Group	Population			Death		
	Male	Female	Total	Male	Female	Total
Under 10	6500	5600	12100	864	560	1424
10 – 30	12200	11700	23900	436	440	876
30 – 50	12800	12200	25000	300	350	650
Above 50	10400	10200	20600	1500	1450	2950

36. (a) Four coins are tossed and let X be the number of heads. Find all the possible outcomes and the probability distribution of X. Find also the expectation of no. of heads. 6

OR

(b) Two dice are thrown together. Find the probability that (i) 6 appears in both the dice (ii) odd no.'s appear in both the dice. 6

37. A player throws a fair die. If a prime number occurs he wins that number of rupees but if a non-prime number occurs he loses that number of rupees. Find the expected gain of the player and conclude. 6

38. (a) The population of a District in decennial censuses were as under : 6

Year :	1941	1951	1961	1971	1981
Population(in thousands) :	42	62	78	90	102

Estimate the population of the district in 1945 by using Newton's forward interpolation formula.

OR

(b) Estimate the sales of 1947 from the following data by using Lagrange's interpolation formula. 6

Year :	1946	1948	1950	1952	1955
Sales(in thousands) :	48	64	80	96	110

39. Given the following frequencies of the positive classes, find out the class frequencies $(\alpha BC),(A\beta C),(AB\gamma),(\alpha\beta C)\&(\alpha\beta\gamma)$: 6

N = 12000, (A) = 977, (B) = 1185, (C) = 596,
(AB) = 453, (AC) = 284, (BC) = 250, (ABC) = 127

40. Samples of two independent groups of 10 children were tested to find how many digits they can repeat from memory after hearing them. The results are as follows: 6

Group I :	8	6	8	7	6	8	7	6	8	6
Group II :	11	7	7	9	7	10	7	6	8	8

Is the difference between the mean scores of the two groups significant?
[Given $t_{0.05}$ for 18 d.f. = 2.10]

41. (a) Define Vital Statistics. Write any five uses of Vital Statistics. 6

OR

(b) Write the meaning of the symbols l_x, d_x, L_x, p_x, q_x, and T_x as used in a life table. 6