2022

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, 2, 3 and 4****, choose the correct answer and rewrite.*

1. The probability of drawing a diamond-king from a well shuffled pack of playing cards is 1

(A) $\frac{1}{13}$

(B) $\frac{1}{52}$

(C) $\frac{4}{13}$

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

2. The second order difference is the difference between two successive values of the 1

(A) Arguments

(B) Entries

(C) First order differences

(D) Second order differences

3. Simpson's one-third rule of numerical integration is obtained from general quadrature formula under the assumption that the function which relates the arguments to the corresponding entries is a polynomial of degree. 1

(A) 1

(B) 2

(C) 3

(D) 4

4. The degree of freedom for t-statistic for testing the hypothesis that the means of two populations are the same, based on samples of sizes 7 and 8 drawn from the two populations separately is 1

(A) 15

(B) 14

(C) 13

(D) 42

5. Find the probability of getting 2 heads in a throw of 3 unbiased coins at a time. 1

6. Define the operator E. 1

7. Write the distributive property of Δ. 1

8. Define numerical integration. 1

9. Define order of a class frequency of attributes. 1

10. Examine whether the attributes, A and B are independent, given that $(AB) = 10$, $(\alpha B)=38$, $(A\beta)=20$ and $(\alpha\beta) = 72$. 1

11. If $(AB) = 25$ and $(A) = 35$ find $(A\beta)$. 1

12. When do you say that a population is stationary ? 1

13. Define crude death rate. 1

14. The number of female members and male members of a place are 497 and 500 respectively. Find the sex ratio of the place. 1

15. Five balls numbered 1 to 5 are placed in a box and one ball is drawn at random. What is the probability that the number on the drawn ball is greater than 3 when it is already known that it is even. 2

16. In a school 45% of the students know English and 35% of them know Hindi and 30% know both English and Hindi. Find the probability that a student chosen at random from the school will know at least one of these two languages. 2

17. Find Δx^2 , the interval of differencing being unity. 2

18. Find the probability of getting three even numbers in a throw of five unbiased dice at a time. 2

19. X follows a Normal distribution with mean and SD, 30 and 5 respectively. Draw the probability curve of X and shade the area which represents $P(28 \leq X \leq 39)$. 2

20. Examine whether the following data of class frequencies of attributes is consistent. 2

$N = 600$ $(A) = 300$ $(B) = 350$ $(AB) = 50$

21. Define biased estimator and unbiased estimator of a population parameter. 2

22. Draw a rough probability curve of student's t- statistic for 3 degrees of freedom and 7 degrees of freedom on same axes and plane. 2

23. Prove that $p_x = 1 - q_x$ where the symbols have their usual meanings as in components of a life table. 2

24. State and prove multiplicative law of probabilities. 4

25. Find the probability that a leap year selected at random will contain 53 Sundays. 4

26. Prove that $\Delta^2 f(a) = f(a + 2h) - 2f(a + h) + f(a)$. 4

27. Establish the general quadrature formula for numerical integration. 4

28. Evaluate $\int_1^5 x^2 \, dx$ by a suitable numerical integration formula. 4

29. Prove that in dichotomous classification of n attributes the number of class frequencies of order r is given by ${}^nC_r \, 2^r$. 4

30. Evaluate : $\Delta^2 (ae^{3x})$, the interval of differencing being h. 4

31. Fill in the blanks of the following table which are marked with question marks. 4

Age(x)	l_x	d_x	p_x	q_x	L_x
20	500	?	?	?	?
21	495	–	–	–	–

32. State and prove additive law of probabilities for two events. 6

OR

State and prove additive law of Expectation of two discrete random variables. 6

33. Estimate the population of a state in 1975 from the following data of decennial censuses. 6

Year	1971	1981	1991	2001	2011
Population (in lakhs)	24	30	34	37	44

OR

From the following Table, find the number of students whose marks are more than 55 marks. 6

Marks	No. of Students
20 – 30	28
30 – 40	34
40 – 50	42
50 – 60	32
60 – 70	28

34. The mean and the variance of a binomial distribution are 2 and $1\frac{1}{3}$. Find the probability of getting one success. 6

OR

Obtain the mean and the variance of a Poisson Distribution with parameter λ. 6

35. Given the following frequencies of positive classes, test the consistency of the data : 6

(A) = 40, (AB) = 30,

(B) = 60 N = 130

OR

The following table gives the classification of 100 workers according to sex and the nature of work :

	Skilled	Unskilled
Males	60	30
Females	20	50

Calculate Yule's coefficient of association and interpret the result. 5+1 = 6

36. Two random samples have the following observations :

Sample no.	Size	Sample mean	Sum of Suqare of deviation from mean
1	10	12	80
2	12	14	100

Test whether the samples come from the same normal population having same mean. 6

(Given: $F_{0.05}$ for (9, 11) d.f. = 2.70 , $t_{0.05 \text{ for } 20 \text{ d. f.}}$ = 2.09)

OR

Two independent samples of sizes 8 and 7 had the following values :

Sample – I	6	9	7	6	5	6	9	8
Sample – II	6	7	9	5	6	7	9	

Test whether the two samples were drawn from two populations having the same variance.

(Table value of the test statistic with corresponding d.f. is 4.17) 6

37. Write the meaning of the symbols *lx, dx, Lx, px, qx* and *Tx* as used in a life table. 6

OR

Define vital statistics. Explain how vital statistics data are obtained by registration method and census method. 6
