

2016

## STATISTICS

Full Marks : 100

Pass Marks : 33

Time : Three Hours and \*Fifteen Minutes

(\*15 minutes are given as extra time for reading questions)

Attempt all questions.

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

For Question Nos. 2, 9, 19, 24, 29 and 32 choose the correct answer and rewrite.

1. Define random experiment. 1
2. If  $A$  and  $B$  are mutually exclusive events, then  $P(A \cup B)$  is equal to 1
  - (A)  $P(A)P(B)$
  - (B)  $P(A) + P(B)$
  - (C)  $P(A) + P(B) - P(A \cap B)$
  - (D) None of the above.
3. What is the probability that a non-leap year selected at random will contain 53 Sundays ? 3
4. State and prove the multiplicative law of probability. 6

5. For any two events  $A$  and  $B$ , indicate the following events in the Venn diagram 3
- (i)  $A \cap \bar{B}$
- (ii)  $A \cap B$
- (iii)  $\bar{A} \cap B$
6. State and prove the theorem on expectation of sum of two discrete random variables. 6
7. Under what conditions Newton's forward interpolation formula is applicable? 1
8. Find  $f(1)$ , given that  $f(0) = -3$ ,  $f(2) = 6$ ,  $f(4) = 8$ ,  $f(6) = 14$ ,  $\Delta f(0) = 9$ ,  $\Delta^2 f(0) = 7$ , and  $\Delta^3 f(0) = 11$ . 4  
(Use appropriate interpolation formula).
9. If  $f(x)$  be a polynomial of  $n^{\text{th}}$  degree in  $x$ , then  $\Delta^n f(x)$  is 1
- (A) zero
- (B) function of  $x$
- (C) one
- (D) constant.
10. Evaluate  $\left[ \frac{\Delta^3}{E} \right] e^x$ , the interval of differencing being unity. 3
11. State and prove the Lagrange's interpolation formula. 6

12. The value of the definite integral  $\int_0^{\pi/2} \sin x dx$ , by using Simpson's one-third rule, is 1.0006. Predict the error by comparing with the exact value of the integral. 1
13. Evaluate  $\int_0^4 x^2 dx$ , by using Simpson's  $\frac{1}{3}$ rd rule for numerical integration. 4
14. Evaluate  $\int_1^7 2x dx$ , by using Trapezoidal's rule for numerical integration. 4
15. Under what conditions Simpson's  $\frac{3}{8}$ th rule is applicable? 1
16. With the usual notations, find  $P$  for a binomial random variable  $x$  if  $n=6$  and  $9P(x=4) = P(x=2)$ . 4
17. For a binomial distribution, mean = 7 and variance = 11. Examine, whether the statement is true or false. 3
18. Draw a rough normal probability curve. 1
19. Equality of mean and variance of a distribution is an indication of the distribution being 1
- (A) Binomial
- (B) Poisson
- (C) Normal
- (D) None of the above.

20. Write the probability density function of normal distribution. 1

21. Define consistency of a set of class frequencies. 1

22. Given the following frequencies of the positive classes, find the frequency of the ultimate classes : 3

$$(A) = 40, (B) = 60, (AB) = 30 \text{ and } N = 130.$$

23. Define Yule's coefficient of association. Write the value of the coefficient for 2+1+1=4

(i) Completely associated attributes.

and (ii) Completely disassociated attributes.

24. The second criterion of independence of two attributes  $A$  and  $B$  is 1

$$(A) \quad \frac{(AB)}{N} = \frac{(A)}{N} \cdot \frac{(B)}{N}$$

$$(B) \quad \frac{(AB)}{N} = \frac{(A) \times (B)}{N}$$

$$(C) \quad \frac{(AB)}{N} = (A) \cdot (B)$$

$$(D) \quad (AB) = \frac{(A)}{N} \cdot \frac{(B)}{N}$$

25. The following table gives the classification of 100 workers according to sex and the nature of work: 5+1=6

	Skilled	Unskilled
Males	40	20
Females	10	30

Calculate Yule's coefficient of association and interpret the result.

26. Define : 2×2=4
- (i) Simple hypothesis
- and (ii) Composite hypothesis

27. Ten individuals are chosen at random from a population and their heights are found to be (in inches) : 60, 63, 64, 59, 66, 69, 69, 70, 72, 68.
- In the light of the data, discuss the suggestion that the mean height in the population is 65 inches.

[Given,  $t_{0.05}$  for 9 d.f. = 2.262]

28. Draw a rough probability curve of Chi-Square distribution. 1

29. For the test Statistic,  $F = \frac{S_2^2}{S_1^2}$  (where  $S_2^2 > S_1^2$ ,  $n_1 = 9$  and  $n_2 = 7$ ), the d.f. of the test Statistic is 1

(A) (9, 7)

(B) (7, 9)

(C) (6, 8)

(D) (8, 6)

30. Write three conditions for the application of Chi-Square test. 3

31. Define Stationary population used in vital Statistics. 1

32. The gross reproduction rate is an index of

- (A) newly born male baby only.
- (B) mortality
- (C) fertility
- (D) None of the above. 1

	Unskilled	Skilled	
	50	40	Males
	30	10	Females

33. Define total fertility rate (T.F.R.) 1

34. Which of the two places for which mortality data are given below, is in your opinion more healthy? 6

Age group (in yrs.)	Locality A		Locality B	
	Standard population		Local population	
	Population	Deaths	Population	Deaths
under 5	3,000	135	4,000	144
5-15	10,000	40	10,500	63
15-65	12,000	60	13,500	81
Above 65	5,000	155	2,000	102
	<b>30,000</b>	<b>390</b>	<b>30,000</b>	<b>390</b>

35. 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. 1×6=6