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Reg. No. : .....

Name : .....

**First Semester B.Sc. Degree Examination, March 2023****First Degree Programme under CBCSS****Statistics****Complementary Course for Mathematics****ST 1131.1 : DESCRIPTIVE STATISTICS AND INTRODUCTION  
TO PROBABILITY****(2014 - 2017 Admission)**

Time : 3 Hours

Max. Marks : 80

Instructions : Use of Scientific Calculators and Statistical tables are allowed.

**SECTION – A**Answer **all** the questions. Each question carries **1** mark.

1. State any two sources of secondary data.
2. What do you mean by sampling errors?
3. Find the arithmetic mean of first  $n$  natural numbers.
4. Define Geometric Mean of a set of  $n$  observations  $x_1, x_2, \dots, x_n$ .
5. Write down the relationship between 50<sup>th</sup> Percentile, 5<sup>th</sup> Decile and 2<sup>nd</sup> Quartile of a distribution.
6. Give Bowley's formula in terms of quartiles of the distribution for measuring skewness.
7. An Urn contains 3 Red, 5 Blue and 4 Green balls. If three balls are drawn at random, what is the probability that no green ball is selected?

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8. If A and B are two mutually exclusive and exhaustive events with  $P(A) = 3P(B)$ , what is the value of  $P(A)$ ?
9. Using axioms of probability show that  $P(A^c) = 1 - P(A)$ .
10. Define conditional probability of an event A given the event B.

**(10 × 1 = 10 Marks)**

### SECTION – B

Answer any **eight** questions. Each question carries **2** marks.

11. Distinguish between classification and tabulation of statistical data.
12. If the class widths of a frequency distribution are not equal. How do you draw histogram of the distribution?
13. How do you construct a less than ogive curve for a frequency distribution?
14. Write a short note on stem and leaf display of data.
15. Explain simple random sampling method.
16. The mean weight of 150 students in a class is 60 kilograms. If the mean weight of boys and girls in the class are 70 kilograms and 55 kilograms respectively, find the number of boys and girls in the class.
17. What do you mean by dispersion of a distribution? Give any two measures of dispersion.
18. Give the relationship between arbitrary moments and central moments. Hence obtain the expression for variance of a distribution in terms of arbitrary moments.
19. Explain (a) sample space and (b) event of a random experiment.
20. For a random experiment of tossing of 3 coins at a time, what is the probability of getting at most one head?
21. If  $P(A) = 1/3$ ,  $P(B) = 1/5$  and  $P(A/B) = 1/6$ , find  $P(B/A)$ .
22. State Bayes' theorem.

**(8 × 2 = 16 Marks)**

## SECTION – C

Answer any **six** questions. Each question carries **4** marks.

23. Explain Population and sample and give various steps involved in selecting a sample from a population.
24. Explain the meaning of frequency distribution and enumerate general rules for construction of a frequency distribution.
25. If  $\bar{X}$  is the arithmetic mean of  $x_1, x_2, \dots, x_n$  then find the arithmetic mean of  $y_1, y_2, \dots, y_n$  where  $y_i = \frac{x_i - c}{h}, i = 1, 2, \dots, n$ ;  $c$  and  $h$  are constants.
26. If mean and standard deviation of two sets A and B are  $\bar{X}_A = 24, \bar{X}_B = 30$ ;  $\sigma_A = 5, \sigma_B = 5$  respectively which of the two sets of observations is more consistent?
27. If A and B are independent events prove that  $P(A/B^c) = P(A)$ .
28. Let  $E_1, E_2, \dots, E_n$  be  $n$  disjoint events with  $P(E_1) \neq 0$  then for any arbitrary event A which is a subset of  $\bigcup_{i=1}^n E_i$  show that  $P(A) = \sum_{i=1}^n P(E_i)P(A/E_i)$
29. A town has 2 fire engines operating independently. The probability that a specific engine is available when needed is 0.96. (a) What is the probability that neither is available when needed? (b) What is the probability that exactly one fire engine is available when needed?
30. Let A and B be events with  $P(A) = 0.25, P(B) = 0.40$  and  $P(A \cap B) = 0.15$ . Find (a)  $P(A \cup B)$  (b)  $P(A \cap B^c)$  (c)  $P(A^c \cap B^c)$  (d)  $P(A/B^c)$
31. A large industrial firm uses local hotels A, B and C to provide overnight accommodation for its clients. From past experience, it is known that 20% of the clients are assigned rooms at hotel A, 50% at hotel B, and 30% at hotel C. If the plumbing is faulty in 5% of the rooms at hotel A, in 4% of the rooms at hotel B, and in 8% of the rooms at hotel C, what is the probability that a client will be assigned a room with faulty plumbing?

**(6 × 4 = 24 Marks)**

SECTION – D

Answer any **two** questions. Each question carries **15** marks.

32. (a) What do you mean by Partition values? Explain Quartiles, Deciles and Percentiles of a distribution

(b) For the following data draw the histogram and hence estimate the value of mode.

Class	:	10-15	15-20	20-25	25-30	30-35
Frequency	:	10	25	50	40	15

33. The Quality Control department of a company conducted a survey and identified following data on lives of two models of washing machines produced by the company.

Life (No. of years)	:	0-2	2-4	4-6	6-8	8-10	10-12
Model A	:	5	16	13	7	5	4
Model B	:	2	7	12	19	9	1

What is the average life of each model? Also identify the model which shows more consistency.

34. (a) The number of persons who volunteered to give a pint of blood at a donor centre was recorded for each of 23 successive Fridays. The data are as follows:

250, 260, 270, 274, 295, 298, 301, 308, 310, 315, 315, 320, 321, 324, 325, 332, 333, 334, 334, 356, 368, 370, 386.

Construct a boxplot and describe the shape of the distribution with respect to symmetry.

(b) What do you mean by Kurtosis? Using moments of the distribution give the expression for measure of Kurtosis. Also interpret the value and classify the distribution.

35. (a) Write down axioms of probability.

(b) State and prove addition theorem of probability.

(c) If  $A_1, A_2, \dots, A_n$  are  $n$  events, explain pairwise independence and mutual independence of  $n$  events and write down conditions for mutual independence of  $n$  events.

(2 × 15 = 30 Marks)