SASTRA DEEMED UNIVERSITY

(A University under section 3 of the UGC Act, 1956)

End Semester Examinations

February 2023

Course Code: **MAT132**

Course: **PROBABILITY & STATISTICS**

QP No. :**U038R-1**

Duration: **3** hours

Max. Marks:**100**

PART –A

Answer all the questions **10 × 2 = 20 Marks**

1. Bev can either take a course in computers or in chemistry. If Bev takes the computer course, then she will receive an A grade with probability $\frac{1}{2}$; if she takes the chemistry course then she will receive an A grade with probability $\frac{1}{3}$. Bev decides to base her decision on the flip of a fair coin. What is the probability that Bev will get an A in chemistry?

2. A random variable X has a uniform distribution over $(-3,3)$. Find k for which $P(X < k) = \frac{1}{3}$.

3. In a precision bomb attack there is 50% chance that any one bomb will strike the target. Two direct hits are required to destroy the target completely. How many bombs must be dropped to give a 99% chance or better of completely destroying the target completely?

4. Derive moment generating function for Poisson distribution.

5. Define statistics

6. What is the difference between internal and external data?

7. Four factories emit a kilogram of pollutant each in 4, 5, 8 and 12 days respectively. What is the average rate of pollutant discharge? Use your answer to calculate the total pollutant discharged by the four factories in one week.

8. Comment the following statement "High positive coefficient of correlation between in the sale of a newspaper and in the number of crimes, leads to the conclusion that newspaper reading may be responsible for the increase in the number of crimes"

9. Define sampling

10. What is the standard error of sample mean?

PART – B

Answer all the questions $4 \times 15 = 60$ ***Marks***

11. (a) In a answering a question on a multiple choice test a student either knows the answer or he guesses. Let p be the probability that he knows the answer and $1-p$ the probability that he guesses. Assume that a student who guesses at answer will be correct with the probability $\frac{1}{5}$, where 5 is the number of multiple-choice alternatives. What is the conditional probability that a student knew the answer to a question given that he answered correctly?

(b) Find the MGF of Normal distribution. **(7+8)**

(OR)

12. (a) A manufacturer, who produces medicine bottles, finds that 0.1% of bottles are defective. The bottles are packed in boxes containing 500 bottles. A drug manufacturer buys 100 boxes from the producer of bottles. Using Poisson distribution, find
(i) No defective (ii) at least two defectives.

(b) In an examination it is laid down that a student passes if he Secures 30% or more marks. He is placed in the first, second or third division according as he secures 60% or more marks, between 45% and 60% marks and marks between 30% and 45% respectively. He gets distinction in case he secures 80% or more marks. It is noticed from the result that 10% of the students failed in the examination, whereas 5% of them obtained distinction. Calculate the percentage of the students placed in the second division. **(5+10)**

13. a) Write down the any five applications of statistics.
b) The following table gives the distribution of monthly income of 600 families in a certain city

Monthly income (00 Rs)	Below 75	75-150	150-225	225-300	300-375	375-450	450 and over
No. of families	60	170	200	60	50	40	20

Draw a 'less than' and a 'more than' ogive curve for the above data on the same graph and from these read the median income. **(5+10)**

(OR)

14. (a) Explain the data classification Qualitative and Quantitative with suitable Examples.
(b) Tabulate the following: Out of a total number of 10,000 candidates who applied for jobs in a government department, 6,854 were males, 3,146 were graduates and others, non-graduates. The number of candidates with some experience was 2,623 of whom 1,860 were males. The number of male graduates was 2,012. The number of graduates with experience was 1,093 that includes 323 females. **(5+10)**

15. (a) Find the mode of the following frequency distribution
(Use Grouping table)

Size(x)	1	2	3	4	5	6	7	8	9	10	11	12
Frequency	3	8	15	23	35	40	32	28	20	45	14	6

(b) The first quartile of the following data is 21.5

Class	10-15	15-20	20-25	25-30	30-35	35-40	40-45	45-50	Total
Frequency	24	?	90	122	?	56	20	33	460

Find the missing frequencies? **(10+5)**

(OR)

16. (a) The following table gives age (X) in years of cars and annual maintenance cost(Y) (in thousands).

X	1	3	5	7	9
Y	15	18	21	23	22

Estimate the maintenance cost for a 4-year old car after finding the regression equations.

(b) Find the correlation coefficient between industrial production and export using the following data and comment on the result.

Product (in crore tons)	27	28	29	30	32	32	33
Exports (in crore tons)	17	18	19	19	21	20	21

(8+7)

17. (a) Explain the terms Sampling Distribution and standard error
(b) The adjoining table ten of random numbers of two digits each is provided to the field investigator.

34	96	61	85	49
78	50	02	27	13

How should he use this table to make a random selection of 5 plots out of 40? **(7+8)**

(OR)

18. (a) Explain about stratified random sampling
(b) Explain the Merits and Demerits of Stratified Random Sampling **(7+8)**

PART – C

Answer the following **$1 \times 20 = 20$ *Marks***

19. (a) The purchasing agent receives samples of envelopes from two suppliers. He had the samples tested in his own laboratory for testing weight with the following results.

Testing weight	Samples from	
	Company A	Company B
50-60	3	10
60-70	42	16
70-80	22	36
80-90	3	8

Which company's envelop is more variable in quality?

(b) Ten competitors in a beauty contest are ranked by three judges in the order.

1st judge	1	4	6	3	2	9	7	8	10	5
2nd judge	2	6	5	4	7	10	9	3	8	1
3rd judge	3	7	4	5	10	8	9	2	6	1

Use the method of rank correlation coefficient to determine which pair of judges has the nearest approach to common taste in beauty?

(10+10)

****