SASTRA DEEMED UNIVERSITY

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

End Semester Examinations

February 2022

Course Code: **MAT132**

Course: **PROBABILITY & STATISTICS**

Question Paper No. : **UGF086** Max. Marks:**100**

PART-A

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

1. Let A, B and C be three mutually exclusive and exhaustive events associated with a random experiment. Find P(A) given that P(B)=3P(A)/2 and P(C)=P(B)/2.

2. Two dice are tossed. Find the probability of getting "an even number on the first dice or a total of 8".

3. What is the need for diagrammatic representation of a data?

4. How will you determine the median from ogive curve?

5. For a group of 200 candidates, the mean was found to be 40. Later on, it was discovered that the scores 43 and 35 were misread as 34 and 53 respectively. Find the corrected mean.

6. An analysis of monthly wages paid to the workers of two firms A and B belonging to the same industry gives the following results:

	Firm A	Firm B
Number of workers	500	600
Average of daily wage	Rs.186	Rs.175
Variance of distribution of wages	81	100

In which firm A or B, is there greater variability in individual wages?

7. State the test statistic to test the significance for difference of means in large sample test.

8. When do you say that a statistic $t = t(x_1, x_2, \ldots, x_n)$, a function of the sample values $x_1, x_2, x_3, \ldots, x_n$ is an unbiased estimate of the population parameter θ.

9. Construct the normal equations to fit the curve $Y = AB^X$.

10. Let X be a random variable with the following probability distribution:

X	-3	6	9
P(X=x)	1/6	½	1/3

determine E(X).

PART -B

Answer all the questions **4 x 15 = 60 Marks**

11. (a) A manager has two assistants and he take his decision on information supplied independently by each one of them. The probability that he makes a mistake in his thinking is 0.005. The probability that an assistant gives wrong information is 0.3. Assuming that the mistakes made by the manager are independent of the information given by the assistants, find the probability that he reaches a wrong decision.

(b) A and B throw alternatively with a pair of balanced dice. A win if he throws a sum of six points before B throws a sum of seven points, while B wins if he throws a sum of seven points before A throws a sum of six points. Player A begins the game. Evaluate the probability of A winning the game. (8+7)

(OR)

12. (a) A certain drug manufactured by a company is tested chemically for its toxic nature. Let the event "the drug is toxic" be denoted by E and the event "the chemical test reveals that the drug is toxic" be denoted by F. Let $P(E) = \theta, P\left(\frac{F}{E}\right) = P\left(\frac{\bar{F}}{\bar{E}}\right) = 1 - \theta$. Show that the probability that the drug is not toxic given that the chemical test reveals that it is toxic is free from θ.

(b) Subway trains on a certain line run every half hour between mid-night and six in the morning. What is the probability that a man entering the station at a random time during this period will have to wait at least twenty minutes? (8+7)

13. Explain the steps involved in finding mode of a distribution using histogram with suitable example.

(OR)

14. Explain the steps involved in constructing a pie diagram with suitable example.

15. (a) Calculate the mean and standard deviation for the following given the age distribution of 542 members:

Age group	20-30	30-40	40-50	50-60	60-70	70-80	80-90
No. of members	3	61	132	153	140	51	2

(b) Calculate the correlation coefficient for the following heights (in inches) of fathers (X) and their sons (Y):

X	65	66	67	67	68	69	70	72
Y	67	68	65	68	72	72	69	71

(8+7)

(OR)

16. (a) For the joint probability distribution of two random variables X and Y given below:

	Y=1	Y=2	Y=3	Y=4	Total

X=1	4/36	3/36	2/36	1/36	10/36
X=2	1/36	3/36	3/36	2/36	9/36
X=3	5/36	1/36	1/36	1/36	8/36
X=4	1/36	2/36	1/36	5/36	9/36
Total	11/36	9/36	7/36	9/36	36/36

Evaluate (i) the marginal distributions of X and Y.

(ii) Conditional distribution of X given the value of Y=1 and that of Y given the value of X=2.

(b) In a partially destroyed laboratory, record of an analysis of correlation data, the following results only are legible:

Variance of X=9, Regression equations are $8X - 10Y + 66 = 0$ and $40X - 18Y = 214$. Evaluate (i) mean values of X and Y (ii) the correlation coefficient between X and Y (iii) the standard deviation of Y? (8+7)

17. (a) Two random samples gave the following results:

Sample	Size	Sample mean	Sum of squares of deviations from the mean
1	10	15	90
2	12	14	108

Test whether the samples come from the same normal population at 5% level of significance. Given F (9,11) = 2.90 and F(11,9)=3.10 (approx.) at 5% level.

(b) The heights of 10 males of a given locality are found to be 70,67,62,68.61,68,70,64,64,66 inches. Is it reasonable to believe that the average height is greater than 64 inches? Test at 5% level assuming that for 9 degrees of freedom P(t>1.83) = 0.05. (8+7)

(OR)

18. (a) Out of 8000 graduates in a town 800 are females, out of 1600 graduate employees 120 are females. Use χ^2 –test to determine if any distinction is made in appointment on the basis of sex. Value of χ^2 at 5% level of significance for one degree of freedom is 3.84.

(b) In a certain factory there are two independent processes manufacturing the same item. The average weight in a sample of 250 items produced from one process is found to be 120 ozs. with a standard deviation of 12 ozs. while the corresponding figures in a sample of 400 items from the other process are 124 and 14. Obtain the standard error of difference between the two sample means. Is this difference significant? (8+7)

PART -C

Answer the following **1 x 20 = 20 Marks**

19. (a) Two random variables X and Y have the following joint probability density function:

$$f(x,y) = \begin{cases} 2-x-y; 0 \le x \le 1, 0 \le y \le 1 \\ 0; otherwise \end{cases}$$

Evaluate (i) Marginal probability density function of X and Y (ii) conditional density functions (iii) Variance of X.

(b) Fit an exponential curve of the form $Y = ab^X$ to the following data:

X	1	2	3	4	5	6	7	8
Y	1	1.2	1.8	2.5	3.6	4.7	6.6	9.1

(10+10)

**