[Time: 3 Hours]

[Marks: 80]

Please check whether you have got the right question paper.

N.B:
1. Questions No. 1 is compulsory.
2. Attempt any THREE out of remaining five questions.
3. Assume any necessary data but justify the same.
4. Figure to the right indicates marks.
5. Use of scientific calculator is allowed.

1. A) The mean and standard deviation of 200 items are found to be 60 and 20. At the time of calculations two items are wrongly taken as 3 and 67 instead of 13 and 17. Find the correct mean and standard deviation.   05

b) In a random arrangement of the letters of the word 'COMMERCE', find the probability that all the vowels come together.   05

c) Find the coefficient of variation for the following data: 05
12,17,20,16,13,11,18,12,18,13

d) Let X be random variable with the following probability distribution. Find $E(2x+1)^2$ 05

X	-3	6	9
P(X =x)	1/6	1/2	1/3

2. a) The joint density function of the two dimensional random variable (X, Y) is given by   10

$$f_{xy}(x, y) = x^3 y^3 / 16 \quad , 0 \le x \le 2, 0 \le y \le 2$$
$$= 0, \quad \text{otherwise.}$$

Find the marginal densities of X and Y. Also find the cumulative distribution functions of X and Y.

b) Calculate Modal marks for data given below: 05

Marks	10-30	30-50	50-70	70-90	90-110	110-130
No. of Students	4	10	14	12	8	6

c) Find the Spearman's Rank correlation: 05

OS	52	34	47	65	43	34	54	65
DS	65	59	65	68	82	60	57	58

3. a) The regression line of y on x for a certain bivariate data is 5y + 3x = 52 and the regression line of x on y is 2x + y = 30. Find   10
   1. the arithmetic mean of x and y
   2. the coefficient of correlation between x and y
   3. the most probable value of y when x = 10

b) We are given a box containing 5000 IC chips, of which 1000 are manufactured by company X and rest by company Y. 10% of the chips made by company X and 5% of the chips made by company Y are defective. If a randomly chosen chip is found to be defective, find the probability that it comes from company X.   05

c) If X is a random variable and a, b are constants, then prove that   05
$$V(aX + b) = a^2 V(x)$$

Turn Over

4. a) State the Baye's theorem. Three machines A, B and C produce respectively 40%, 10% and 50% of the items in a factory. The % of defective items produced by the machine is respectively 2%, 3% and 4%. An item from the factory is selected at random. **10**
    1. Find the probability that the item is defective.
    2. If the item is defective, find the probability that the item was produced by machine C

    b) Test consistency of the following data: **05**
    N = 60 (AB) = 25 (A) = 51 (B) = 32

    c) Two hundred randomly selected adults were asked whether TV shows as a whole are primarily entertaining, educational or a waste of time. The respondents were categorized by gender. Is there a relationship between gender and opinion in the population interest? **05**
    (Critical value of X^2 = 5.99)
    Their responses are given in the table below:

Actual frequencies	Opinion		
Gender	Entertaining	Educational	Waste of time
Male	52	28	30
Female	28	12	50

5. a) Calculate Bowley's coefficient of skewness for the following: **10**

Class	30-35	35-40	40-45	45-50	50-55	55-60
Frequency	5	10	30	35	15	5

    b) The means of two samples of sizes 50 and 100 respectively are 54.1 and 50.3 and the standard deviation are 8 and 7. Obtain the standard deviation of the sample of size 150 obtained by combing the two samples. **05**

    c) Prove with example that mutual independence does not imply pair wise independence. **05**

6. a) Calculate standard deviation for the following data: **05**

20-30	30-40	40-50	50-60	60-70	70-80	80-90
3	61	132	153	140	51	2

    b) Show that whether A and B are independent, positively associated or negatively associated. **05**
    (AB) = 128, (α B) = 84, (A β) = 24 and (α β) = 72

    c) Two dice are rolled. Let X denote the random variable which counts the total number of points on the upturned faces. Construct a table giving the non-zero values of the probability mass function. **05**

    d) The mean of marks in statistics of 100 students in a class was 72. The mean of marks of boys was 75, while their number was 70. Find the mean of girls in the class. **05**