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MAT 2001-STATISTICS FOR ENGINEERS

Digital Assignment -I

1. Find the mean, median, mode for the following data.

(i)

Wages :	2000–3000	3000–4000	4000–5000	5000–6000	6000–7000
No. of workers:	3	5	20	10	5

(ii) For the following frequency table calculate mean, median and mode:

C.I	20-40	40-60	60-80	80-100	100-120	120–140	140–160	160–180	180-200
f :	6	9	11	14	20	15	10	8	7

2. Calculate Mean deviation, standard deviation, Quartile deviations for the following data

(i)

Age in years:	20 – 30	30–40	40–50	50 – 60	60 – 70	70–80	80 –90
No. of members:	3	61	132	153	140	51	2

(ii) Compute the quartile deviation as well as coefficient of skewness:

Size:	4-8	8-12	12-16	16-20	20-24	24-28	28-32	32-36	36-40
Frequency:	6	10	18	30	15	12	10	6	2

3. Find the mean, standard deviation and coefficient of variation of breaking strength of 80 test pieces of certain alloy from the following table

Breaking strength	44-46	46-48	48-50	50-52	52-54
No.of pieces	3	24	27	21	5

4. The probability distribution of X, the number of imperfections per 10 meters of a synthetic fabric in continuous rolls of uniform width is given below.

x:	0	1	2	3	4
P(x):	0.41	0.37	0.16	0.05	0.01

Find the mean and variance of imperfections per 10 meters of the fabric?

5. Impurities in the batch of final product of a chemical process often reflect a serious problem. From considerable plant data gathered, it is known that the proportion Y of impurities in a batch has density function given by

$$f(y) = \begin{cases} 10(1-y)^9, & 0 \le y \le 1 \\ 0, & elsewhere \end{cases}$$

(i) Verify that the above is a valid density function.

(ii) A batch is considered not sellable and then not acceptable if the percentage of impurities exceeds 60%. With the current quality of the process, what is the percentage of batches that are not acceptable?

6. (i) If the joint probability distribution of X and Y is given by f(x, y)=(x + y)/ 30, for x =0 ,1,2,3; y =0,1,2

Find (a) P(X ≤ 2,Y = 1) (b) P(X>2,Y ≤ 1) (c) P(X>Y) (d) P(X + Y = 4).

(ii) The joint distribution of X and Y is given by

$$p(x,y) = \frac{2x+3y}{72}, \quad x = 0,1,2; \ y = 1,2,3$$

(a) Find all marginal distributions of X and Y

(b)Find the conditional distribution of X given Y=1

7. i) A fast-food restaurant operates both a drive through facility and a walk-in facility. On a randomly selected day, let X and Y , respectively, be the proportions of the time that the drive-through and walk-in facilities are in use, and suppose that the joint density function of these random variables is

$$f(x,y) = (2/3)(x+2y), \quad 0 \le x \le 1, \ 0 \le y \le 1$$

(a) Find the marginal density of X. (b) Find the marginal density of Y

ii) Each rear tire on an experimental airplane is supposed to be filled to a pressure of 40 pounds per square inch (psi). Let X denote the actual air pressure for the right tire and Y denote the actual air pressure for the left tire. Suppose that X and Y are random variables with the joint density function

$f(x, y) = k(x^2 + y^2)$, $30 \le x < 50$, $30 \le y < 50$, and $f(x, y) = 0$, elsewhere.

(a) Find k. (b) Find $P(30 \le X \le 40, 40 \le Y < 50)$. (c) Find the probability that both tires are under filled.

8. The joint probability density function of X and Y is

$$f(x,y) = \begin{cases} 4xy\, e^{-(x^2+y^2)}, & 0 \le x \le \infty \\ 0, & 0 \le y \le \infty \end{cases}$$

Verify whether X and Y are independent random variables?

9. Two random variables X and Y have the following joint probability density functions.

$$f(x,y) = \begin{cases} k(4-x-y), & 0 \le x \le 2, \quad 0 \le y \le 2 \\ 0, & elsewhere \end{cases}$$

Find i) The constant k

ii) The marginal densities of X and Y

(ii) The conditional densities of X and Y.

(iii) Var(X) (v) Var(Y) (vi) COV(X,Y)