Indian Institute of Information Technology and Management, Gwalior

P&S (MA102)

Mid-Term Examination (Session 2023-24)

Maximum Time: 2 Hours | Max marks: 30

All the questions are compulsory

1. The median and mode of the following wage distribution are known to be Rs. 33.50 and Rs. 34 respectively. Find the values of f_3, f_4, and f_5 **[5]**.

Wages (in Rs.)	Frequency
0-10	4
10-20	16
20-30	f_3
30-40	f_4
40-50	f_5
50-60	6
60-70	4
Total frequency	230

2. Find the mean deviation from the mean and standard deviation of an arithmetic progression $a, a+d, a+2d, \ldots, a+2nd$ and verify that the latter is greater than the former. **[5]**.

3. A lot contains 20 articles. The probability that the lot contains exactly 2 defective articles is 0.4, and the probability that the lot contains exactly 3 defective articles is 0.6. Articles are drawn from the lot at random one by one without replacement and are tested till all defective articles are found. What is the probability that the testing procedure ends at the twelfth testing? **[5]**

4. A drunk performs a random walk over positions $0, +1, -1, +2, -2, \ldots$ as follows. He starts at 0. He takes successive one unit steps, going to the right with probability p and to the left with probability 1-p. His steps are independent. Let X denotes his positions after n steps. Find the distribution of $\left(\frac{X+n}{2}\right)$ and find $E(X)$. **[5]**

5. A manufacturer of cotter pins knows that 5% of his product are defective. If he sells cotter pins in box of 100 and guarantees that not more than 10 pins will defective, what is the approximate probability that a box will meet to fail the guaranteed. **[5]**

6. If X is normally distributed with mean 12 and Standard deviation 4 find out the probability of following : **[5]**

   1. $X \geq 20$
   2. $X \leq 20$
   3. $0 \leq X \leq 12$
   4. Find c such that $P(X > c) = 0.24$.