Q.1 The probability distribution of the random variable net profit of a company’ is given below. Calculate expected net profit of the company.

|  |  |
| --- | --- |
| Net Profit | Probability |
| -5000 | 0.2 |
| 10,000 | 0.5 |
| 30,000 | 0.3 |

Q.2 Given the probability function

P (X) = , X = 1, 2, 3, 4

Calculate the mean and variance of X.

Q.3 The probability distribution of daily sales of 1 liter bottle of a soft drink at a store is given as

|  |  |
| --- | --- |
| No of bottles | Probability |
| 20 | 0.2 |
| 21 | 0.4 |
| 22 | 0.2 |
| 23 | 0.1 |
| 24 | 0.1 |

Calculate mean and standard deviation of the distribution.

Q.4 There are four projects being considered and the payoffs for the four options are modeled as a discrete distribution with probability distribution as follows

|  |  |
| --- | --- |
| Payoff (Rs. 000) | Probability |
| 0 | 0.50 |
| 10 | 0.25 |
| 20 | 0.15 |
| 30 | 0.10 |

i Find the expected value of the option payoff

ii Describe what this expected value represents

iii Find the standard deviation of the option payoff

iv Find the probability that the option will pay at least Rs. 20.

Q.5 Two components of a laptop computer have the following joint probability density function for their useful lifetimes and (in years):

1. Find the marginal probability density function of
2. Find the marginal probability density function of

iii) What is the probability that the lifetime of at least one component exceeds 1 year (when the manufacturer's warranty expires)?

Q.6 Let denote the number of times a photocopy machine will malfunction: , or 3 times, on any given month. Let denote the number of times a technician is called on an emergency call. The joint p.m.f. is presented in the table below:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  |  | | |  |  |
|  | 0 | 1 | 2 | 3 |  |
| 0 | 0.15 | 0.30 | 0.05 | 0 | 0.50 |
| 1 | 0.05 | 0.15 | 0.05 | 0.05 | 0.30 |
| 2 | 0 | 0.05 | 0.10 | 0.05 | 0.20 |
|  | 0.20 | 0.50 | 0.20 | 0.10 | 1.00 |

1. Find the probability P( Y > X ).

ii) Find Cov ( X, Y )

Q.7 In a binomial distribution, n = 5 and p = 0.7. Calculate probabilities for x = 0, 1, 2 and 3.

Q.8 Mean and variance of a binomial probability distribution are 2 and 1 respectively. Find P (x = 2).

Q.9 The probability that a packet of biscuit containing broken biscuit is 0.2. A sample of 7 packets was checked. Calculate the probability that

i Exactly 4 packets contain broken biscuits.

ii Less than mean number of packets contain broken biscuit.

iii At least 5 packets will contain broken biscuits

Q.11 The probability that a patient recovers from a delicate heart operation is 0.95. What is the probability from the next 7 patients having this operation?

i Exactly two survived.

ii At least five survived.

iii Exactly two died.

Q.12 It is known that 8% of the production of a manufacturer is defective. A random sample of 10 items is selected. Find

i) P (X = 3) ii) E (X) iii) V (X)

Q.13 **A cell phone factory builds phones using two machines, they are labeled simply as Machine A and Machine B. Production records show that 72% of cell phones are produced on Machine A. Furthermore, 18% of all phones built using machine A are defective and 24% of all phones built on machine B are defective. Given this information:**

i) Calculate the probability that a random cell phone was produced on Machine A and is defective

ii) Calculate the probability that a random cell phone was produced is defective

iii) Using Bayes' Theorem, calculate the probability that a cell phone was produced on Machine A given that it was found to be defective.