1. What is binomial variate? When binomial distribution is more preferred?

2. What do you mean by Poisson variate? Under what conditions Binomial distribution tends to Poisson distribution.

3. What do you mean by parameters? Why is it important?

4. What do you mean by Binomial distribution? Describe the characteristics of Binomial distribution.

5. What do you mean by Poisson distribution? Describe the characteristics of Poisson distribution.

6. Comment on the following that mean and variance of Binomial distribution are 7 and 11 respectively. (Ans: incorrect)

7. Find p if n = 6 and 9 P (X = 4) =P(X=2). (Ans: ¼)

8. In a Binomial distribution with 6 independent trials, the probability of 3 and 4 success is found to be 0.2457 and 0.08189 respectively. Find the parameters, mean, variance.

(Ans: 4/13, 1.84, 1.27)

9. The mean and variance of Binomial distribution are 3 and 2 respectively. Find the probability of (i) less than or equal to 2 (ii) greater than or equal to 7.

(Ans: 0.37, 0.008)

10. In a bombing campaign, there is the probability of hitting the target is 50%. How many bombs should be drooped so there is 99.9% chance of hitting the target if

1. one hit is enough to destroy the target
2. at least two hits are required to destroy the target. (Ans: 9,4)

11. 13. The probability that a student will graduate is 0.4. Determine the probability that out of 5 students :(i) none(ii)one (iii) at least one and (iv) all will graduate.

**(Ans: 0.077 , 0.259 , 0.922, 0.01)**

12. At a particular university it has found that 20% of the students withdraw without completing the Statistics Course. Assume that 18 students have registered for the course; i) what is the probability that none will withdraw? ii) What is the probability that at least one will withdraw iii) what is the probability that at most 2 will withdraw.

(Ans: 0.01 , 0.44 , 0.26)

13. A programmer succeeds twice as often as it fails while developing a specific program. Find the chance that in the next six attempt, there will be at least four successes. (Ans: 0.342)

14. A discrete random variable *X* has mean equal to 6 and variance equal to 2. If it is assumed that the underlying distribution of *X* is binomial, what is the probability that 5 < X < 7? (Ans: 0.273)

15. A software package consists of 12 programs, ﬁve of which must be upgraded. If 4 programs are randomly chosen for testing,

(a) What is the probability that at least two of them must be upgraded?

(b) What is the expected number of programs, out of the chosen four, that must be upgraded?

( Ans: 0.554, 2.216)

16. An exciting computer game is released. Fifty percent of players complete all levels. Forty percent of them will then buy advanced version of the game. Among 12 users what is expected number of people who will buy the advanced version? What is probability that (i) at least two people will buy it (ii) at most three people will buy it. ( Ans: 2.4, 0.725, 0.794)

1.7 A large chain retailer purchase a certain kind of electronic device from a manufacturer .the manufacturer indicates that the defective rate of the device is 5%.

a)The inspector randomly picks 20 items from the shipment. What is the probability that there will be at least one defective item among these 20?

b) suppose that the retailer receives 10 shipment in a month and the inspector randomly tests 20 devices per shipment. What is the probability that there will be exactly 3 shipments each containing at least one defective device among the 20 that are selected and tested from the shipment? (Ans: 0.64, 0.02)

18. An automatic machine makes paper clips from coils of wire. On the average, 1 in 400 paper clips is defective. If the paper clips are packed in boxes of 100, assuming that the process follows Poisson distribution, what is the probability that any given box of clips will contain, (i) no defective, *(ii)* one or more defectives, *(iii)* less than two defectives?

(Ans: 0.77 , 0.22 , 0.96)

19. The chance of traffic accidents in a day in a street of Nepal is assumed to be 0.0005. On how many days can you expect i) no accidents ii) more than three accidents if there are 1000 such streets. (Ans: 221 , 43 days per year)

20. An office switch board receives telephone calls at the rate of 3 calls per minute on average. What is the probability of receiving i) no calls on one minute interval ii) at most 4 calls in 3 minute interval. (Ans: 0.049, 0.945)

21. A hospital have an average of 4 emergency calls in 10 minutes interval. What is the probability that (i) there are at most 2 emergency calls in a minute (ii) there are exactly 3 telephone calls in 10 minutes? (Ans: 0.992, 0.434)

22. If a random variable X follows Poisson distribution such that P(X = 1) = P(X = 2), find the mean and variance of the distribution. (Ans : 2 ,2.)

23. A manufacturer of pen drives knows that 3% of his product is defective. If he sells in boxes of 200 and guarantees that not more than 2 pen drives will be defective, what is the probability that a box will fail to meet the guaranteed quality? ( Ans: 0.93)

24. A dangerous computer virus attacks a folder consisting of 250 ﬁles. Files are aﬀected by the virus independently of one another. Each ﬁle is aﬀected with the probability 0.032. What is the probability that more than 5 ﬁles are aﬀected by this virus? ( Ans: 0.808)

25. Suppose that the number of telephone calls between 10 A.M. and 11 A.M., denoted by X, is Poisson variate with mean 2 and the number of telephone calls between 11 A.M. and 12noon, denoted by Y, is Poisson variate with mean 4. If X and Y are independent what is the probability that there are at least 5 telephone calls between 10 A.M. to 12 noon? ( Ans: 0.55)

26. A source of liquid is known to contain bacteria with the mean no of bacteria per cubic centimeter equal to 3. Ten 1 cubic centimeter test tubes are filled with the liquid. Assuming the Poisson distribution is applicable. Calculate the probability that i) All 10 test tubes will show growth (i.e. at least 1 bacteria each) ii) Exactly 7 test tubes will show growth. (Ans: 0.6, 0.21)

27. Fit the Binomial distribution and find the expected frequencies for the following data.

Also find F(X) , P(X > 3) , P(X < 3)

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| X | 0 | 1 | 2 | 3 | 4 | 5 | 6 | total |
| f | 7 | 6 | 19 | 35 | 23 | 7 | 1 | 98 |

28. Five fair coin are tossed 100 times. From the following data fit the appropriate distribution and find the expected frequencies if (i) p = ½ (ii) p is obtained from given data.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| No. of heads | 0 | 1 | 2 | 3 | 4 | 5 |
| Observed frequency | 2 | 10 | 24 | 38 | 18 | 8 |

29. Fit the Poisson distribution and find expected frequencies Also (i) find mean (ii) variance (iii) F(x) (iv) P(X of the Poisson distribution

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Mistakes per page | 0 | 1 | 2 | 3 | 4 | 5 |
| No. of pages | 142 | 156 | 69 | 27 | 5 | 1 |