

1. a. A and B alternatively roll a pair of dice, A wins if he throws six before B throws 7 and B wins if he throws 7 before A throws six. If A begins the game what is the chance B winning? (10)
- b. UrnI has 2 white and 3 black balls UrnII has 4 white and 1 black balls and UrnIII has 3 white and 4 black balls and an Urn is selected at random and a ball drawn at random is found to be white what is the probability urnII was selected? (10)

OR

2. a. A problem is given to 3 students, whose chances of solving it are $\frac{1}{2}$, $\frac{1}{3}$ and $\frac{1}{4}$ respectively. What is the probability that (i) only one of them solves the problem (ii) the problem is solved (iii) None solves the problem. (10)
- b. A bag contains 7 red and three black marbles and another bag contains 4 red and 5 black marbles. One marble is transferred from the first bag into the second bag and then a marble is taken out of the second bag at random. If this marble happens to be red, find the probability that a black marble was transferred. (10)
3. The probability function of infinite discrete distribution is given by $P(X=j) = \frac{1}{2^j}$, $j = 1, 2, \dots, \infty$ (a) verify that the total probability is 1. (b) Find $P(X \text{ is even})$ (c) Find $P(X \geq 5)$ (d) Find $P(X \text{ is divisible by } 3)$ (e) Find the mean.
- OR**
4. The joint pdf of 2D random variable, $f(x,y) = k(6-x-y)$; $0 < x < 2$; $0 < y < 4$ and 0 elsewhere (a) find the value of k (b) $P(X < 1, Y < 3)$ (c) $P(X < 1/Y < 3)$ (d) $P(Y < 3/X < 1)$

5. a. Suppose that during a rainy reason in an island, the length of shower has a exponential dist with average of 2 min (i) find probability that shower will there for more than 3 minutes (ii) if shower has already lasted for 2 mins, what is the probability that it will last for at least 1 more min.(10)
- b. In a certain factory producing razor blades, there is a small chance of $\frac{1}{500}$ for any blade to be defective. The blades are in packets of 10. Use Poisson distribution to calculate the approximate number of packets containing (i) no defective (ii) one defective (iii) two defective blades respectively in a consignment of 10,000 packets.(10)

OR

6. a. A Random Variable has mean $m = 12$ and variance $s^2 = 9$ and an unknown probability distribution find $P(6 < X < 18)$. (10)
- b. Fit a binomial distribution to the given data and calculate the expected frequencies. (10)

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|---|---|----|----|----|---|---|---|
| X | 0 | 1 | 2 | 3 | 4 | 5 | 6 |
| f | 5 | 18 | 28 | 12 | 7 | 6 | 4 |

7. Two random processes $\{X(t)\}$ and $\{Y(t)\}$ are define by $X(t) = A \cos wt + B \sin wt$ and $Y(t) = B \cos wt - A \sin wt$, show that $\{X(t)\}$ and $\{Y(t)\}$ are jointly Wide Sense Stationary.

OR

8. a. The following data give the corresponding values for pressure and specific volume of a super heated steam. Find the rate of change of pressure with respect to volume when $v = 2$. (10)

| | | | | | |
|------------|-----|------|------|------|------|
| Volume V | 2 | 4 | 6 | 8 | 10 |
| Pressure P | 105 | 42.7 | 25.3 | 16.7 | 13.0 |

b. Evaluate $\int_0^6 \frac{dx}{1+x}$ using (i) Trapezoidal Rule (ii) Simpson's 1/3 rule and (iii) Simpson's 3/8 rule

9. Obtain the values of y at $x=0.1$ and 0.2 for the differential equation $y' = x+y$, given $y(0)=1$, using a. Taylor's series (6) b. Euler method (5) c. Runge-Kutta Method (9)

Wishing you All the Best
