Unit – X
RANDOM VARIABLE
Section – A
One mark questions

1. Define Random Variable (U)
2. Define Discrete Random Variable (U)
3. Define Continuous Random Variable. (U)
4. What is meant by Probability Distribution ? (K)
5. Define Probability Mass Function (U)
6. Define Mathematical Expectation. (U)
7. Express variance in terms of expectation. (K)
8. Define a Joint Probability Mass Function. (U)
9. What is the value of E(8) if 8is a constant? (A)
10. What is the value of V(4) if 4 is a constant? (A)
11. What is the value of COV(X Y) if X and Y are independent? (K)

12. Express covariance in terms of expectation (K)
13. What is the value of r for two independent random variables? (K)

Section – B
Two marks questions

14. If X is a random variable and a is a constant then prove that E(a)=a (K)
15. If X is a random variable and a is a constant then prove that E(aX) = a E(X) (K)
16. If X ia random variable and b are any two constants, then prove that E(aX+b) = a E(X)+b
17. If X is a random variable and a is a constant then prove that V(a) = 0 (K)
18. If X is a random variable and a is a constant then prove that V(aX) = a^2 V(X) (K)
19. Write the formula for correlation coefficient in terms of expectation. (K)
20. If E(X) = 5 and E(X^2) = 36, find S.D(X). (S)
21. If E(X^2) = 25 and Var (X) = 16, find E(X). (S)
22. If E(X) = 10 and S.D(X) = 12, find E (X^2). (S)
23. If E(X) = 5 ,what is E(6X)? (A)
24. If E(X)= 8 what is E(4X+3)?. (A)
25. If E(X)= 2 what is E(--2X) ? (A)
26. If V(X) = 6 what is V(3X) ? (A)
27. If V(X) = 4 what is V(6X+7) ? (A)
28. If V(X) = 3 , then find Var(-X) (A)
29. V(X) = 9 , then find the values of Var(X/3) (S)
30. If V(X) = 16 , then find the values of Var(3 – X) (S)

Section – C/E
Five marks questions

31. A person tosses a coin thrice. Find the expected number of heads. (S)
32. A random variable X which assumes the values -1, 0 and 1 with respective probabilities 1/4, 1/2 and 1/4. Find the mean and variance. (S)
33. Find the value of k and then find the mean of the following distribution (A)

x	1	2	3	4	5	6
p(x)	0.1	0.15	k	0.25	0.18	0.12

34. A box contains 8 items of which 2 are defective. A man selects 3 items. Find the expected number of defective items in the selection. (S)
35. Given the following probability distribution, find E(X). (A)

x	-2	-1	1	2
p(x)	1/5	2/10	3/10	2/5

36. Calculate E(X+4) for the following probability distribution. (A)

x	10	15	20
p(x)	1/6	2/6	3/6

37. Prove addition theorem of expectation for two discrete random variables X and Y. (K)
38. Prove multiplication theorem of expectation for two independent random variables X and Y. (K)
39. In a bi-variate data E(X)= 4, E(Y) = 10, E(X^2)= 25, E(Y^2) = 136 and E(XY) = 20. Find Karl pearson's correlation. (A)
40. In a bi-variate data E(X) = 6 E(Y) = 9, E(X^2)= 30 , E(Y^2) = 120 and E(XY) = 20. find r_{xy}. Conclude. (A)

41. In a bi-variate data, E(X) = 0 , E(Y) = 12 , $E(X^2)$ = 49, $[E(X)]^2$ = 145 and E(XY) = 3.5
Find Cov(X, Y) and r_{xy}. (A)

42. For the following probability distribution, find E(X), Var(X) , S.D(X) and E(2X-4). (A)

X	-1	0	1	2
p(X)	1/5	1/10	1/13	2/5

43. Find the mean and variance of the following distribution. (A)

X	0	1	2	3	4
p(X)	3/8	1/4	1/8	3/16	1/16

44. From the following probability distribution, find the missing probability, mean and standard deviation of ' X ' (A)

X	-2	-1	0	1	2
p(x)	0.2	0.3	0.2	?	0.1

45. Find the mean, variance and the value of 'k' of the following probability distribution. (A)

X	-3	-2	0	2	3
p(X)	k/6	k/12	2k/3	k/2	k/6

46. A random variable ' X ' assumes the values 10 and 20 with respective probabilities 1/3 and 2/3 Find its mean and variance. (A)

47. A random variable 'X' assumes the values 5 and 10 with probabilities 0.6 and 0.4 respectively. Find E(X), E(2X), V(X). (A)

48. A bag has 4 white and 6 red balls. Two balls are randomly drawn from the bag, find the expected number of white balls. (S)

49. A bag contains 4 green and 3 red balls. A man draws 3 balls at random from the bag. If he is to receive Rs.200 for every green ball he draws and Rs.50 for every red one. What is his expectation? (S)

50. A person throws a biased coin. He gets Rs.80 if head appears otherwise he gets Rs.20. If the probability of occurrence of head is 1/3, find his expected amount. (S)

51. A man throws a fair die. If the throw results in an even number, he gets Rs500 otherwise he loses Rs.100 find his expectation. (S)

52. A man throws a fair die once. If the number obtained is divisible by 3 he gets Rs.900, otherwise he loses Rs250, find his expectation . (S)

53. A person, by paying Rs.50 enters into a game of shooting a target. With one shot, if he hits the target , he gets Rs 1000, otherwise he gets nothing If his probability of hitting the target is 1/7. Find his expected amount. (S)

54. In a lottery, there are 1000 tickets costing Re.1 each. There is one first prize worth Rs.100, two second prizes worth Rs.20 each and ten third prizes worth Rs.10 each. Find the expected loss in buying one ticket. (S)

55. A bag has 3 one-rupee, 4 two rupees and 2 five rupees coins . A boy picks two coins at random from the bag . What is the expectation of the amount 0f the coins? (S)

56. A bag contains 6 tickets numbered 1 to 6. A person draws two tickets at random. If the sum of the numbers on the tickets drawn is even, he gets Rs.100, otherwise he loses Rs.50. What is his expectation? (S)

57. Two fair coins are tossed once. A person receives Rs.10 if both head appears and Rs.5 if both tail appears, otherwise he loses Rs. 8, find the expectation of a person. (S)

58. The probability of a person hitting a target is 2/3. If he hits the target he gets Rs.150, otherwise he loses Rs. 50. Find his expectation. (S)

59. From the following joint probability distribution of X and Y. Find the value of k, E(X+Y) and y_{xy} (A)

X \ Y	1	3	9
2	0.1	0.1	0.05
4	0.2	K	0.1
6	0.1	0.15	0.2

60. For the following joint probability distribution of X and Y, find r and E(3X+4Y) . (A)

Y \ X	1	2	3
-5	0	0.1	0.1
0	0.1	0.2	0.2
5	0.2	0.1	0

61. From the following bivariate data of X and Y find (i) 'k' (ii) E(2X+3Y) (A)

x\ y	0	10	20
1	0	0.1	0.1
2	0.1	0.2	0.1
3	0.2	k	0.1

62. From the following bi-variate data of X and Y find co-efficient of correlation between X and Y (A)

x\ y	0	10	20
1	0	0.1	0.1
2	0.1	0.2	0.1
3	0.2	0.1	0.1

63. For the following data find r_{xy} (A)

x\ y	1	2	3
5	0	0.1	0.1
0	0.1	0.1	0.2
1	0.1	0.2	0.1

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