



xiii) $E (XY) = E (X) E (Y)$ implies that the random variables X and Y are

- a) independent
- b) uncorrelated
- c) linearly related
- d) none of these.

xiv) Critical region is a region of

- a) acceptance
- b) rejection
- c) indecision
- d) none of these.

GROUP – B

(Short Answer Type Questions)

Answer any *three* of the following. $3 \times 5 = 15$

2. In a shooting competition, the probability of a man hitting the target is $\frac{1}{5}$. If he fires 5 times, what is the probability of hitting the target at least twice ?
3. There are two identical boxes containing respectively 4 white and 3 red balls & 3 white and 7 red balls. A box is chosen at random and a ball is drawn from it. Find the probability that the ball is white.
4. Prove that for two discrete random variables X and Y

$$E (X + Y) = E (X) + E (Y).$$



5. Find the maximum likelihood estimate for parameter having Poisson distribution.

6. If a random variable X has mean m and standard deviation σ , show that

$$E\left(\frac{x-m}{\sigma}\right) = 0 \text{ and } E\left(\frac{x-m}{\sigma}\right)^2 = 1.$$

GROUP - C

(Long Answer Type Questions)

Answer any *three* of the following. $3 \times 15 = 45$

7. a) The probability that Asok can solve a problem is $\frac{4}{5}$, that Amal can solve is $\frac{2}{3}$ and that Abdul can solve is $\frac{3}{7}$. If all of them try independently, find the probability that the problem will be solved.

b) If A and B are independent events and $P(A) = \frac{2}{3}$, $P(B) = \frac{3}{5}$, find $P(A+B)$, $P(A^c/B)$ and $P(A^c B)$.

c) If A and B are independent events, then prove that

i) A^c and B^c are also independent.

ii) A^c and B are also independent. 5 + 4 + 6



8. a) State Baye's theorem.
- b) Urn-1 contains 5 red and 5 black balls, urn-2 contains 4 red and 8 black balls and urn-3 contains 3 red and 6 black balls. One urn is chosen at random and a ball is drawn. The colour of the ball is black. What is the probability that it has been drawn from urn-3 ?
- c) If A and B are two events not necessarily mutually exclusive, prove that

$$P (A + B) = P (A) + P (B) - P (AB). \quad 3 + 7 + 5$$

9. a) The following table gives the number of aircraft accidents that occurred during various days of a week. Find whether the accidents are uniformly distributed over the week. 8

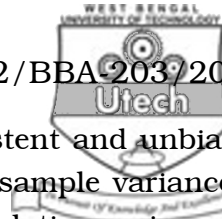
Days	SUN	MON	TUE	WED	THU	FRI	SAT
Nos. of accidents	6	8	8	20	11	9	14

Given : $\chi^2_{6, 0.05} = 12.59$.

- b) X is a continuous random variable with probability density function given by

$$\begin{aligned}
 f (x) &= kx (0 \leq x < 2) \\
 &= 2k (2 \leq x < 4) \\
 &= - kx + 6k (4 \leq x < 6)
 \end{aligned}$$

Find k and mean value of X . 7



10. a) Show that the sample mean is consistent and unbiased estimate of the population mean but sample variance is consistent but biased estimate of population variance. 8
- b) If a random variable X follows normal distribution such that $P(9.6 < X < 13.8) = 0.7008$ and $P(X > 9.6) = 0.8159$ where the standard normal variable Z satisfies $P(Z < 0.9) = 0.8159$ and $P(Z < 1.2) = 0.8849$, find the mean and variance of X . 7
11. a) In a survey of buying habits, 400 women shoppers are chosen at random in supermarket A located in a certain section of the city. Their average weekly food expenditure is Rs. 250 with a standard deviation of Rs. 40. For 400 women shoppers chosen at random in supermarket B in another section of the city, the average weekly food expenditure is Rs. 220 with a standard deviation of Rs. 55. Test at 1% level of significance whether the average weekly food expenditure of the two populations of shoppers are equal. 8
- b) The joint probability distribution of the random variables X and Y is shown below :

	Y	0	1	2
X				
2		0.05	0.10	0.25
4		0.15	0.05	0.15
6		0.10	0.10	0.05

Find,

- i) the conditional distribution of X , given $Y = 1$
- ii) the conditional distribution of X , given $Y = 2$
- iii) the probability $P(X + Y > 6)$. 7

