Roll.No. | 20UMAAT3003

SHRIMATHI DEVKUNVAR NANALAL BHATT VAISHNAV COLLEGE FOR WOMEN
(AUTONOMOUS)
(Affiliated to the University of Madras and Re-accredited with 'A+' Grade by NAAC)
Chromepet, Chennai - 600 044.
B.Sc Mathematics- END SEMESTER EXAMINATIONS - NOVEMBER 2025
SEMESTER - III
20UMAAT3003 - Mathematical Statistics – I

Total Duration : 2 Hrs.30 Mins. Total Marks : 60

Section B

Answer any **SIX** questions $(6 \times 5 = 30$ Marks)

1. If two dice are thrown, what is the probability that the sum is
   (a) greater than 8, and
   (b) neither 7 nor 11?

2. Three groups of children contain respectively 3 girls and 1 boy, 2 girls and 2 boys, and 1 girl and 3 boys. One child is randomly selected from each group. Show that the chance that the three selected consist of 1 girl and 2 boys is $1/3$.

3. A random variable X has the following probability function:

x :	-2	-1	0	1	2	3
p(x):	0.1	k	0.2	2k	0.3	k

   Find the value of k and calculate the mean and variance.

4. A coin is tossed until a head appears. What is the expectation of the number of tosses?

5. If X is a random variable and 'a' is a constant prove that
   (i) $E(aX) = aE(X)$
   (ii) $Var(aX) = a^2 Var(X)$

6. In a precision bombing attack there is a 50% chance that anyone bomb will strike the target. Two direct hits are required to destroy the target completely. How many bombs must be dropped to give a 99% chance or better of completely destroying the target?

7. If X is a Poisson variate such that P(X =2) =9 P(X = 4) + 90 P(X =6)
   Find λ, the mean of X.

8. Define uniform distribution and mention its Moment generating function, characteristic function and mean deviation about mean.

Contd...

Section C

Answer any **THREE** questions $(3 \times 10 = 30$ Marks)

9. The contents of urns I, II and III are as follows:
   1 white, 2 black and 3 red balls,
   2 white, 1 black and 1 red balls, and
   4 white, 5 black and 3 red balls

   One urn is chosen at random and two balls are drawn. They happen to be white and red. What is the probability that they come from urns I, II and III?

10. For the following bivariate probability distribution of X and Y, find

	y=0	y=1	y=2	y=3
x=0	k	2k	3k	4k
x=1	4k	6k	8k	2k
x=2	9k	12k	3k	6k

    Determine
    (i) value of k
    (ii) $P(X \leq 1, Y = 2)$
    (iii) $P(X \leq 1)$
    (iv) $P(Y = 2)$ and
    (v) $P(Y \leq 3)$.

11. Show that a random variable X can have no moments although its moment generating function exists.

12. If X is a normal variate with mean 30 and standard deviation 5.
    Find the probabilities that
    (i) $26 \leq X \leq 40$
    (ii) $X \geq 45$
    (iii) $|X - 30| > 5$

13. Let $X \sim \beta_1(\mu, v)$ and $Y \sim \lambda, \mu + v$ be independent random variables $(\mu, \lambda, v > 0)$. Find a p.d.f. for XY and identify its distribution.

*****