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. Maths - END SEMESTER EXAMINATIONS APRIL - 2024
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. Define (i) Mutually exclusive events
   (ii) Exhaustive events
   (iii) Equally likely events
2. Prove that if A and B are any two events (subsets of sample space S) and are not disjoint, then P(A∪B) = P(A)+P(B)-P(A∩B)
3. Write a short note on discrete and continuous random variables?
4. A continuous random variable X has a probability density function f(x) = $3x^2$, 0≤x≤1. Find a and b such that (i) P(X≤a) = P(X>a) and (ii) P(X>b) = 0.05.
5. A coin is tossed until a head appears. What is the expectation of the number of tosses required?
6. State and Prove Chebychev's inequality.
7. Define normal distribution mention its properties.
8. Derive moments and moment generating function of uniform distribution.

Section C

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

9. The probabilitie, of X, Y and Z becoming managers are 4/9, 2/9 and 1/3 respectively. The probabilities that the bonus scheme will be introduced if X, Y and Z becomes managers are 3/10, 1/2 and 4/5 respectively. (i) what is the probability that bonus scheme will be introduced and (ii) If the bonus scheme has been introduced, what is the probability that the manager appointed was X?
10. A random variable X has the following probability function:

x	0	1	2	3	4	5	6	7
p(x)	0	k	2k	2k	3k	k2	2 k2	7 k2+k

(i) Find k (ii) Evaluate P(X<6), P(X≥6) and P(0<X<5) (iii) Determine the distribution function of X.

Contd...

11. Prove the following results:
    (i) If X and Y are random variables, then E(X+Y) = E(X) + E(Y)
    (ii) If X and Y are independent random variables, then E(XY) = E(X) . E(Y)

12. A random variable X is normally distributed with mean 12 and standard deviation 4. Find out the probability of the following:
    (i) $X \geq 20$ (ii) $X \leq 20$ and (iii) $0 \leq X \leq 12$.

13. If X and Y are independent gamma variates with parameters μ and ν respectively. Show that the variables U = X+Y, $Z = \frac{X}{X+Y}$ are independent and that U is a $\gamma(\mu+\nu)$ variate and Z is a $\beta_1(\mu, \nu)$ variate.

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