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 NOVEMBER -2023
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 p_1 = P(A), p_2= P(B), p_3 = P(A∩B), (p_1, p_2, p_3>0); Express the following in terms of p_1, p_2, p_3.

   i) P $(\overline{A \cup B})$ ii) P $(\bar{A} \cup \bar{B})$ iii) P $(\bar{A} \cap B)$ iv) P (A|B) v) P (B|$\bar{A}$)

2. A continuous random X has a p.d.f f(x)=$3x^2$, 0≤x≤1. Find a and b such that

   i) P(X≤a) = P(X>a) ii) P(X>b)=0.05

3. State & Prove Addition Theorem of Expectation for two Random Variables.

4. In a Poisson frequency distribution, frequency corresponding to 3 successes is 2/3 times frequency corresponding to 4 successes. Find the mean and Standard deviation of the distribution.

5. Define Beta Distribution of Second kind and establish its various constants.

6. A and B alternately cut a pack of cards and the pack is shuffled after each cut. If A starts and the game is continued until one cuts a diamond, What are the respective chances of A and B first cutting a diamond?

7. A Petrol Pump is supplied with petrol once a day. If its daily volume of Sales (X) in thousands of litres is distributed by:

   $$f(x) = 5(1-x)^4 \text{ ,} 0 \leq x \leq 1,$$

   What must be the capacity of its tank in order that the probability that its supply will be exhausted in a given day shall be 0.01?

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

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Section C

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

9. i) State Bayes' Theorem.
   ii) 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 ball and
   4 White, 5 Black and 3 Red balls.
   One Urn is chosen at random and two balls drawn from it. They happen to be White and red. What is the Probability that they come from urns I, II or III.

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	k^2	$2k^2$	$7k^2+k$

   i) Find k
   ii) Evaluate P(X<6) , P(X≥6) and P(0<X<5)
   iii) If P (X≤a)> 1/2, Find the minimum value of 'a'.
   iv) Determine the distribution function of X.

11. State and Prove Chebychev's Inequality.

12. Seven Coins are tossed and number of heads noted. The experiment is repeated 128 times and the following distribution is obtained :

No.of Heads	0	1	2	3	4	5	6	7	total
Frequencies	7	6	19	35	30	23	7	1	128

    Fit a binomial distribution assuming
    i) The Coin is unbiased
    ii) The nature of the coin is not known.

13. Define Gamma Distribution. Deduce its M.G.F, Cumulant Generating function and other constants.

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