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. END SEMESTER EXAMINATIONS NOVEMBER-2022
SEMESTER - I
20USTCT1002 - Probability and Random Variables

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

Section A

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

1. State and Prove Addition Theorem of Probability.
2. Describe the multiplication rule of probability.
3. 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	2 k^2	7 k^2+k

   Compute (i) k (ii) p(X<6) (iii) P(0<x<5)
4. Describe the continuous distribution function and its properties.
5. State and prove the addition theorem of expectation.
6. Apply discrete and continuous variables, explain the conditional expectation and conditional variance.
7. Describe the properties of moment generating function.
8. Infer convergence in probability.

Section B

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

9. For n events, A_1, A_2,..., A_n show that,
   $P(\bigcap_{i=1}^{n} A_i) \geq \sum_{i=1}^{n} P(A_i)$ - (n-1) and $P(\bigcup_{i=1}^{n} A_i) \leq \sum_{i=1}^{n} P(A_i)$
10. In 2022, there will be three candidates for the position of Principal Dr.Babu, Dr.Hari and Dr.Oviya whose chances of getting the appointment are in the proportion 4:2:3 respectively. The probability that, Dr. Babu if selected would introduce co-education in the college is 0.3. The probabilities of Dr. Hari and Dr.Oviya doing the same are respectively 0.5 and 0.8.

Contd...

(i) What is probability that there will be co-education in the college in 2023?
(ii) If there is coeducation in the college in 2023, what is the probability that Dr.Oviya is the principal.

11. In Continuous distribution whose relative frequency density is given by;
$$f(x) = y_o.x(2-x),\ 0 \leq x \leq 2$$
(i) Show that the distribution is symmetric
(ii) Determine mean, median and mode
(iii) Determine the mean deviation about mean

12. State and Prove the Cauchy Schwartz inequality.

13. Justify the application and proof of the weak law of large numbers.

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