WEST BENGAL STATE UNIVERSITY

B.Sc. Honours 2nd Semester Examination, 2020

STSACOR03T-Statistics (CC3)

PROBABILITY AND PROBABILITY DISTRIBUTIONS-I

Time Allotted: 2 Hours   Full Marks: 40

The figures in the margin indicate full marks.
Candidates should answer in their own words and adhere to the word limit as practicable.
All symbols are of usual significance.

GROUP-A

Answer any *four* questions from the following   5×4 = 20

1. Define conditional probability and show that it satisfies all the axioms of probability.   5

2. For any two events *A* and *B*, show that   5
    $$\text{Max}\{0, P(A)+P(B)-1\} \leq P(A\cap B) \leq \text{Min}\{P(A),P(B)\} \leq \text{Max}\{P(A),P(B)\}$$

3. Define with example a random variable. When will it be discrete or continuous? What are p.m.f. and p.d.f. in this context?   5

4. Find mean and variance of geometric distribution.   5

5. For any three events *A*, *B* and *C*,   5
    Prove that $P(A\cup B\,|\,C) = P(A\,|\,C) + P(B\,|\,C) - P(A\cap B\,|\,C)$.

6. Describe the intuitive idea of probability in terms of relative frequency. What do you mean by 'event' and 'exhaustive event'?   5

GROUP-B

Answer any *two* questions from the following   10×2 =20

7. (a) State and prove Bayes' theorem.   5

    (b) A box contains 7 red and 13 blue balls. Two balls are selected at random and are discarded without their colours being seen. If a third ball is drawn randomly and observed to be red, what is the probability that both of the discarded balls were blue?   5

8. (a) Stating underlying assumptions, show that binomial distribution can be approximated by Poisson distribution.   5

  (b) If $X \sim B(n, p)$, develop a recursive relation for central moments of X.   5

9. (a) Define distribution function of a random variable and its important properties.   5

  (b) A five figure number is formed by the digits 0, 1, 2, 3, 4 (without repetition). Find the probability that the number formed is divisible by 4.   5

10. (a) Let two independent random variables X_1 and X_2 have the same geometric distribution. Show that the conditional distribution of $X_1/(X_1 + X_2 = n)$ is uniform.   4

  (b) Find the moment generating function of X when $X \sim P(\lambda)$. Also, find $E(X)$ and $\mathrm{Var}(X)$.   6

    N.B. : *Students have to complete submission of their Answer Scripts through E-mail / Whatsapp to their own respective colleges on the same day / date of examination within 1 hour after end of exam. University / College authorities will not be held responsible for wrong submission (at in proper address). Students are strongly advised not to submit multiple copies of the same answer script.*

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