U.G. 2nd Semester Examination - 2021

STATISTICS

[PROGRAMME]

Course Code : STAT(G)CC-T-1B

(Introductory Probability)

Full Marks : 25(20+5) Time : 1 Hour

The figures in the right-hand margin indicate marks.

Candidates are required to give their answers in their own words as far as practicable.

Notations and symbols have their usual meaning.

1. Answer any **five** questions: 1×5=5

   a) How does 'random experiment' differ from 'deterministic experiment'?

   b) The proportion of defective items in a large lot is observed. Write down the sample space.

   c) Write down the p.m.f. of a Hypergeometric distribution.

   d) State the weak law of large numbers.

   e) Write down the multiplication law of probability for three events.

   f) Define moment generating function of a random variable. How does this function generate moments?

[Turn over]

   g) Define convergence in probability of a sequence of random variables.

   h) What is the probability of getting a sum of 8 in throwing two fair dice simultaneously?

2. Answer any **one** question: 5×1=5

   a) Give the classical definition of probability. What are the limitations of this definition? The probabilities that a problem can be solved by each of three students are 4/5, 2/3 and 3/7, respectively. If all of them try independently, what is the probability that the problem is solved?

   b) For what value of A, the following function would be a p.m.f. of a random variable X?

   $f(x) = A.\left(\frac{1}{2^x}\right)$, x= 0, 1, 2, ….; and f(x) = 0, otherwise.

   Find P(X>0|X<2).

   c) Derive the m.g.f. of a Poisson distribution with parameter λ and hence find the variance of the distribution.

3. Answer any **one** question: $10\times1=10$

a) i) For any three events A_1, A_2 and A_3, show that

$$P(A_1 \cap A_2 \cap A_3) \geq P(A_1)+P(A_2)+P(A_3)-2$$

ii) Find the probability that an odd integer, chosen at random from the first 400 positive integers, will be divisible by 5 or 7. 5+5

b) i) What is Central Limit Theorem? State De-Moivre Laplace Central Limit Theorem.

ii) If $\{X_n, n = 1, 2,\ldots.\}$ be a sequence of independent random variables with $P\left\{X_n = n^{\frac{1}{4}}\right\} = P\left\{X_n = n^{\frac{1}{4}}\right\} = \frac{1}{2}$, verify whether WLLN holds for the sequence. 5+5

[Internal Assessment: 5]

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