2018

2nd Semester

STATISTICS

PAPER—GE2T

(Generic Elective)

Full Marks : 40

Time : 2 Hours

The figures in the margin indicate full marks.

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

Illustrate the answers wherever necessary.

Group—A

1. Answer any *five* questions : 5×2

(i) If $P(A) = \frac{2}{7}$ and $P(B) = \frac{6}{11}$, what is the probability that at least one of the two independent events A and B will occur?

(ii) Show that two events cannot be simultaneously mutually exclusive and mutually independent.

(iii) Define probability density function of a random variable X.

(iv) For a binomial distribution, the mean and S.D. are 4 and $\sqrt{3}$ respectively. Calculate the probability of getting a non-zero value from this distribution.

(v) Check whether the following function can be accepted as a probability density function

$$f(x) = \frac{5}{\sqrt{\pi}} e^{-25x^2}, \quad -\infty < x < \infty.$$

(vi) Write down the sample space when one unbiased coin is flipped repeatedly until 'tail' comes.

(vii) Define convergence in probability.

(viii) State Lindeberg-Levy central limit theorem.

Group—B

2. Answer any *four* questions : 4×5

(i) Find the mode of normal distribution with mean μ and variance σ^2.

(ii) Derive the moment generating function of a Binomial distribution with parameters n and p. Hence obtain the mean and the variance of the distribution.

(iii) There are three boxes numbered 1 to 3 that contain 3 red and 1 blue, 3 blue and 1 red, 2 red and 2 blue balls respectively. One box is chosen at random and one ball is drawn at random from it.

(a) What is the probability that the ball drawn will be a red one?

(b) If it is given that the ball drawn is red, what is the probability that it came from box 1?

(iv) Given $P(A) = p$, $P(B|A) = P(B^c|A^c) = 1 - p$, show that $P(A|B)$ is independent of p. Also obtain $P(A^c|B^c)$.

(v) Examine whether the weak law of large numbers holds for the sequence $\{x_k\}$ of independent random variables defined as follows :

$$\left.\begin{aligned} P\left(x_k = \pm 2^k\right) &= 2^{-(2k+1)} \\ P(x_k = 0) &= 1 - 2^{-2k} \end{aligned}\right\}.$$

(vi) State the important properties of distribution function of a random variable.

Group—C

3. Answer any *one* question : 1×10

(i) State and prove any two important properties of normal distribution. 5+5

(ii) (a) What are the limitations of the classical definition of probability. Write down the axiomatic definition of probability.

(b) Consider the experiment of rolling a pair of fair dice ; check whether the following events are pairwise independent on mutually independent :

A : event that an even number appears on the first die

B : event that an even number appears on the second die

C : enent that the sum of face value is 7.

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