UG/2nd Sem/STAT/G/19

2019

B.Sc. (General)

2nd Semester Examination

STATISTICS

Paper - DSC 1BT

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.

1. Answer any *five* out of *eight* questions : 2×5=10

(a) Define a random experiment. Explain with an example.

(b) Give the limitations of the classical definition of probability.

(c) State the axiomatic definition of probability.

(d) Let C_1 and C_2 be two independent events with $P(C_1) = 0.6$ and $P(C_2) = 0.3$. Compute :

(i) $P(C_1 \cap C_2)$, (ii) $P(C_1 \cup C_2)$

(e) Distinguish between a discrete random variable and a continuous random variable.

(f) Find the constant C so that $p(x)$ satisfies the condition of being a pmf of a random variable x;

$$p(x) = \begin{cases} C\left(\frac{2}{3}\right)^x & ; x = 1, 2, \ldots.. \\ 0 & \text{elsewhere} \end{cases}$$

(g) Give the properties of cumulative distribution function.

(h) State Lindberg Levy Central Limit Theorem.

2. Answer any *four* out of the *six* questions : 4×5=20

(a) Show that conditional probability satisfies all the axioms of axiomatic definition of probability. 5

(b) Each of four persons fires one shot at a target. Let C_K denote the event that the target is hit by person K, K=1,2,3,4. If C_1, C_2, C_3, C_4 are independent and if $P(C_1)=P(C_2)=07$, $P(C_3)=0.9$ and $P(C_4)=0.4$, compute the probability that :

(i) all of them hit the target

(ii) exactly one hits the target. 5

(c) If C_1 and C_2 are independent events, show that the following pairs of events are also independent: (i) C_1 and C_2^C, (ii) C_1^C and C_2, (iii) C_1^C and C_2^C. 5

(d) Show that Binomial distribution may be approximated by Poisson distribution. (state the conditions to be used). 5

(e) Let X be a random variable having exponential distribution with *p.d.f.*

$$f(x) = \lambda e^{-\lambda x}\,;\ x>0$$

(i) Find the *c.d.f.* of X. 2

(ii) Also find $E(X)$. 3

(f) $\{X_n\}$ is a sequence of independent random variables such that $P(X_k = 2^k) = P(X_k = -2^k) = \frac{1}{2}$. Determine if they obey Weak Law of Large Numbers. 5

3. Answer any *one* out of *two* questions : 1×10=10

(a) In a certain factory, machines I, II and III are all producing springs of same length. Machines I, II and III produce 1%, 4% and 2% defective springs respectively of the total production of springs in the factory, Machine I produces 30%, Machine II produces 25% and Machine III produces 45%.

(i) If one spring is selected at random from the total springs produced in a given day, determine the probability that it is defective. 5

(ii) Given that the selected spring is defective, find the conditional probability that it was produced by Machine II. 5

(b) Derive the moment generating function of normal distribution with parameters μ and δ^2. Hence show that the odd order central moments of the distribution are zero. Also obtain the expression for the even ordered central moments. 4+3+3