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Paper / Subject Code: 79458 / Statistics :Paper II

SYBA Sem III Regular
1/11/18
2·30 – 5·30
pages – 3

(25)

(Time: 3 Hours) **(Total Marks: 100)**

N.B. 1. All questions are compulsory.
2.Attempt any two sub-questions from three sub-questions fromQ.2, Q.3, Q.4, Q. 5
3. Figures to the right indicate full marks.
4. Use of non-programmable calculator is allowed.

Q.1 a. Attempt ANY FIVE sub-questions: **(20)**

i. A and A^c form partition of S. State true or false. Give reason.

ii. $P(A/B) \geq P(B)$. State true or false. Give reason.

iii. If a random variable x has a Uniform distribution with, range 1 to n, then its variance is -----

iv. The number of parameters involved in binomial p.d.f is/are.... State the parameter/s.

v. For a Poisson distribution Mean = 5 and Variance = 8. State true or false. Give reason.

vi What is the median of a distribution in terms of Cumulative distribution function?

vii In hypergeometric distribution units are selected with replacement.. State true or false. Give reason.

b. Answer the following in one/ two sentences: (Any Five) (10)

i. If X is a discrete random variable then define Quartiles.

ii. Define a Bernoulli experiment.

iii. State mean of a hypergeometric distribution..

iv. If $P(A) = 1/12$, $P(B) = 1/3$ and $P(A \cap B) = 1/52$, find $P(A/B)$ and $P(B/A)$.

v. Give any 2 examples of a random variable which follows uniform distribution.

vi When are two events mutually exclusive as well as independent?

vii Cov (X, Y) =0 implies that X and Y are two independent random variables. State true or false and give reason.

Q.2 Attempt any TWO sub-questions: **(20)**

a. i. Suppose A and B are independent events, defined on a sample space S, then prove that (05)
- A and B^c are independent
- A^c and B are independent

ii. The odds that A speaks truth are 6:2 and odds that B speaks truth are 7:4. In what percentage of cases are A and B likely to contradict each other on an identical point? (05)

b. i. State and Prove Multiplication theorem of probability for two events A and B. (05)

ii. A bag contains 12 white and 18 black balls. Two balls are drawn in succession without replacement. What is the probability that first is white and the second is black? (05)

c Widgets are manufactured in three factories A,B and C. The proportion of defective widgets from each factory are as follows. (10)

Factory A : 0.01
Factory B : 0.04
Factory C : 0.02

Factories A, B produce 30% of the widgets apiece, and the remaining 40% come from factory C. Imagine that an upset customer returns a defective widget to your company. As the manager finds out the probabilities that defective widget had come from 3 factories, which factory is liable for penalty?

Q.3 Attempt any TWO sub-questions: **(20)**

a. i. Given Joint probability mass function of two discrete random variables, how does one examine whether they are independently distributed? (03)

ii. A box contains 3 red marbles and 5 green marbles. Two marbles are taken at random without replacement. Let X be the number of green marbles obtained. Obtain the probability distribution of X and state the cumulative distribution function of X. (07)

b. i. State and prove addition theorem of expectation for two random variables. (04)

ii. Find the value of k if a random variable X has the following probability distribution: (06)

X	-2	-1	0	1	2	3
P(x)	0.1	K	0.2	2k	0.3	k

Hence obtain

- $P(X<1)$
- $P(X\geq 0)$
- $P(-1<X\leq 2)$
- $P(-1\leq X\leq 1)$

c. A discrete random variable X has the following probability distribution (10)

X	1	2	3	4
P(x)	0.4	0.3	0.2	0.1

Obtain the first 3 raw moments. Hence find first three central moments. Also find mean, variance and coefficient of skewness.

Q.4 Attempt any TWO sub-questions: **(20)**

a. i. Define a random variable X having discrete Uniform distribution. Derive its mean and variance. 07

ii. The mean and the variance of a binomial variate with parameters n and p are 2.4 and 1.44 respectively. Find P(X=0) (03)

b. If x is a Poisson variate with parameter "m", write probability distribution of X. Derive mean and variance of X. (10)

c. i. Derive recurrence relation for probabilities of binomial distribution with parameters n and p. (05)

ii. A jar contains 25 pieces of candy of which 11 are yoghurt covered nuts and the rest are yoghurt covered raisins. Let X be the number of candies with nuts in a random sample of 7 pieces of candy selected without replacement. Compute P(X>5) (05)

Q.5 Attempt any TWO sub-questions: (20)

a. i. Define Cumulative distribution function of a discrete random variable. Also state its properties. (05)

ii. Five boys and 2 girls are to be seated in a row. Find the probability that (05)
- Girls are together
- Girls are not together

b. The joint p.m.f of random variables X and Y is as given below: (10)

X\Y	1	2
1	0.1	0.2
2	0.2	0.1
3	0.3	0.1

Find correlation coefficient between X and Y

c. i Give three applications of Poisson distribution (03)

ii It is stated that 2% of optical lenses supplied by a manufacturer are defective. What is the probability that in a random sample of 200 lenses (07)
- 3 or more are defective
- At least two are defective
- At most two are defective

(Given e^{-4}= 0.001832, $e^{-0.4}$= 0.6703)
