L

FYBA
Sem I
Stats

XYgADC

Marks : 100

Time : 3 Hours

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

Q1.a) Answer any FIVE from the following:- **(10)**

(i) Two mutually exclusive events always happen together. Comment.

(ii) Define discrete random variable.

(iii) $P(B) = \frac{3}{5}$ and $P(A \cap B) = \frac{6}{10}$ and A, B are independent events. Find $P(A \cup B)$.

(iv) For any three events A, B and C, state the expression for $P(A \cup B \cup C)$.

(v) State the distribution for which mean = variance.

(vi) The mean of Binomial distribution with parameters n and p is less than variance. Is the statement true? Give reason.

(vii) A random variable X is such that mean = 2, S. D= 3, find μ_2'.

b) Answer any FIVE from the following: - **(10)**

(i) State condition under which hypergeometric distribution tends to binomial distribution.

(ii) Explain the term conditional probability with suitable example.

(iii) X is a binomial variate with mean 3.and $15P(X=0)=2P(X=1)$. Find the parameter of the distribution

(iv) Given that A and B are two mutually exclusive events, $P(A)=0.6$ and $P(B)=0.3$ find $P(A/B)$.

(v) State addition theorem on probability

(vi) Define fist two raw moments.

(vii) If $V(x) = 1$ then find $V(2x+3)$

Q2 Attempt any TWO sub-questions from the following:

a) Define with the help of example the following terms – **(10)**

1. Certain event
2. Impossible event
3. Mutually Exclusive events
4. Exhaustive events
5. Equally likely events
6. Complementary events

b)

i) Give classical definition of probability and state its limitations. **(5)**

ii) A can hit a target 3 times in 5 shots, B can hit the target 2 times in 5 shots and C can hit the target 3 times in 4 shots. If A, B and C try once to hit the target simultaneously, find the probability that- **(5)**

1. The target is hit
2. two shots hit the target

c)

i) State and prove multiplication theorem on probability. **(5)**

ii) How will you modify the expression if the events are independent? **(5)**

Q3 Attempt any TWO sub-questions from the following:

a)

i) Define cumulative probability distribution function of a discrete random variable. Also, state its important properties. **(5)**

ii) If $P(x) = (5-x)/10$ where $x=1,2,3,4$ **(5)**

$= 0$ otherwise

Verify whether P(x) is probability mass function. If so obtain expression for c.d.f

b) Define mathematical expectation E(X) and Variance V(X) of a discrete random variable. Also show that **(10)**

(i) $E(aX+b)=aE(X)+b$

(ii) $V(aX+b)=a^2V(X)$ where a and b are constants.

c) Define the following for two discrete random X and Y **(10)**

1. Joint probability mass function
2. Marginal probability mass function
3. Conditional probability mass function.
4. When do you say that X,Y are independent? What is the effect of independence on conditional distribution?

Q4 Attempt any TWO sub-questions from the following:

a) If a random variable X follows Poisson distribution with parameter m obtain expression for its mean and variance **(10)**

b)

i) Show that binomial distribution can be approximated to poisson distribution. **(5)**

ii) Each sample of water has 10% chance of containing a particular organic pollutant. Assume that out of the next 18 samples, (i)exactly 2 contain the pollutant (ii) at most 2 contain the pollutant. **(5)**

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c)

i) An unbiased dice is rolled. Write down the p.m.f for the number on the uppermost face. Obtain its mean and variance (5)

ii) Show that the hypergeometric distribution can be approximated to binomial distribution. (5)

Q5 Attempt any TWO sub-questions from the following:

a)

i) Define raw and central moments of a random variable. State the relationship between first four raw and central moments. (5)

ii) Three unbiased coins are tossed. What is the probability of getting at most two heads? (5)

b)

i) Define probability mass function and state its two properties. (5)

ii) The probability mass function of a random variable x is given by (5)

x	-1	0	1	2
P(x)	0.1	0.3	0.4	0.3

Find mean and variance.

c)

i) Define co-variance between two random variable X and Y. Also show that COV(X,Y)=E(XY)-E(X)E(Y) (5)

ii) A variate X follows poisson distribution with parameter 5. Evaluate (i) p(x=0) (ii) p(x=1) (iii) p(x>1). Given that $e^{-5}=0.00674$. (5)

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