Seat No.

**B.Sc. (Part – I) (Semester – II) Examination, 2011**
**STATISTICS (Paper – IV)**
**(Discrete Probability Distributions)**
**Sub. Code : 47847**

Day and Date : Wednesday, 19-10-2011 Total Marks : 40
Time : 10.30 a.m. to 12.30 p.m.

***Instructions:*** *1) All questions are compulsory.*
*2) Figures to the right indicate full marks.*

1. Choose the correct alternative : **8**

i) Variance of binomial distribution with parameters n, p is

A) np B) npq C) p D) pq

ii) For Bernoulli distribution mean is 0.6 then, $P(X = 0)$ is

A) 0.6 B) 0.5 C) 0.4 D) 0.3

iii) If X be a discrete random variable and 'a' be any constant then var(ax) is

A) avar(X) B) var(X) C) $a^2$var(X) D) 0

iv) First order central moment is

A) 1 B) 0 C) variance D) mean

v) If random variable X is number appears on a throw of a fair die then E(X) is

A) 3 B) $\frac{7}{2}$ C) $\frac{1}{6}$ D) Does not exist

vi) The distribution satisfy lack of memory property is

A) Geometric B) Poisson C) Binomial D) None of these

vii) Random variable is a real valued function defined on

A) Power set B) Sample space
C) Empty set D) Compound event

viii) The distribution of sum of two independent and identical Bernoulli random variables is

A) Bernoulli B) Binomial C) Geometric D) Poisson

2. Attempt **any two** of the following : **16**

   i) Define probability mass function and cumulative distribution function (c.d.f.). State the important properties of c.d.f.

   ii) Define discrete uniform distribution. Obtain its mean, variance and p.g.f.

   iii) Define geometric distribution. Obtain its recurrence relation for probabilities. State and prove lack of memory property of geometric distribution.

3. Attempt **any four** of the following : **16**

   i) State and prove additive property of Poisson distribution.

   ii) Derive recurrence relation for probabilities in case of binomial distribution.

   iii) Define $r^{th}$ raw and central moments. Obtain second central moment in terms of raw moments.

   iv) Define negative binomial distribution. Obtain its mean.

   v) Prove that :

      a) E (C) = C, where 'C' is constant.

      b) E (aX+b) = aE (X) + b, where a, b are constants.

   vi) A discrete r.v. X has the following probability distribution

| X=x | –1 | 0 | 1 | 2 |
|---|---|---|---|---|
| P(x) | k | 2k | 0.2 | 5k |

   Find :

   a) K   b) $P(|x| \leq 1)$.

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Total No. of Pages : 2

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# B.Sc. (Part - I) (Semester - II) Examination, 2013

## STATISTICS (Paper - IV)

## Discrete Probability Distributions

## Sub. Code : 47847

**Day and Date : Tuesday, 16-4-2013**

**Time : 11.00 a.m. to 1.00 p.m.** **Total Marks : 40**

**Instructions : 1. All questions are compulsory.**

**2. Figures to the right indicate full marks.**

**Q.1)** Choose the most correct alternative : **[8]**

i) A random variable X is said to be discrete if it takes...... sample points.

(a) Finite (b) Countably infinite

(c) Finite or Countably infinite (d) Uncountably infinite

ii) Expected value of a constant 'c' is......

(a) 0 (b) 1

(c) 'c' itself (d) Cannot be defined.

iii) A function which generates probabilities is a .....

(a) Mean (b) Variance

(c) Probability generating function (d) Skewness.

iv) For ..... distribution, P(X=K) =1.

(a) Two Point (b) One Point

(c) Bernoulli (d) Poisson.

v) The distribution of sum of independent and identical Bernoulli random variable is...... distribution.

(a) Bernoulli (b) Geometric

(c) Binomial (d) Poisson.

vi) If $X \rightarrow H(N,M,n)$, then mean of x is .....

(a) M/N (b) n/N

(c) nM/N (d) nN/M

vii) If $X \rightarrow$ Poisson ($\lambda$), then P (x + 1) =..... P (x).

(a) $(x+1)/\lambda$ (b) $\lambda/(x+1)$

(c) $x/\lambda$ (d) $\lambda/x$

viii) If X has geometric distribution with parameter p whose E(X)=4, then P=.........

(a) 0.2 (b) 0.25

(c) 0.33 (d) 1

*P.T.O.*

**Q.2)** Attempt **any two :** **[16]**

i) Define expectation of a discrete random variable.

Prove that if a and b are constant then

i) $E(aX+b)=a\,E(X)+b$ ii) $E(X-a)^2 = V(X) + [E(X) - a]^2$

ii) Define binomial distribution. State its mean and variance. Obtain probability generating function of Binomial distribution.

iii) Define Poisson distribution with parameter '$\lambda$'. Obtain its mean and variance.

**Q.3)** Attempt **any four :** **[16]**

i) State any four properties of cumulative distribution function (c.d.f.)

ii) A discrete random variable X has the following probability distribution

| X = x | - 1 | 0 | 1 | 2 |
|---|---|---|---|---|
| P (X) | 2 K | 4 K | 0.4 | 6 K |

Find : a) k b) $P(|x| \leq 1)$

iii) If a discrete uniform random variable assuming values 1, 2,....., n has mean 6. Find $P(X > 8)$.

iv) Obtain recurrence relation for the successive probabilities of hypergeometric distribution.

v) If X follows geometric distribution with p=0.3, find $P(X > 10 \mid X > 2)$.

vi) Define negative binomial distribution. Obtain its mean.

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Total No. of Pages : 4

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# B.Sc.(Part-I) (Semester-II) Examination, April-2016
# STATISTICS
## Discrete Probability Distributions (Paper-IV)
## Sub. Code : 59686

Day and Date : Sunday, 17-04-2016

Total Marks : 50

Time : 12.00 noon to 2.00 p.m.

Instructions :
1) All questions are compulsory.
2) Figures to the right indicate full marks.

**Q1)** Choose the most correct alternative: **[10]**

a) If p.g.f. of discrete r.v. X is $(1 + s)/2$ then p.g.f. of X + 1 is ________.

i) $(s + s^2)/2$ ii) $(s - 1)/2$

iii) $(s + 1)^2/4$ iv) $(s + 1)$

b) If p.m.f. of r.v. X is as given below then mean of r.v. X is ________.

| X | –1 | 1 |
|---|---|---|
| P(x) | 1/2 | 1/2 |

i) 0 ii) 1

iii) –(1/2) iv) –1

c) Let X be a discrete r. v. then V(–2X) = ________.

i) V(X) ii) 4 V(X)

iii) –2 V(X) iv) –4 V(X)

d) If F(x) is the distribution function of random variable X then F(∞) = ________.

i) 0 ii) 1

iii) –1 iv) ∞

*P.T.O.*

e) If X is a discrete r.v. with mean E(X), then $E[X-E(X)]^2$ is called ________.

i) Mean    ii) Variance

iii) S.D.    iv) Median

f) The limiting distribution of hypergeometric distribution is binomial distribution if ________.

i) $N \to \infty, M/N \to 1/2$    ii) $N \to \infty, M/N \to p$

iii) $N \to 0, M/N \to 1$    iv) $N \to 0, M/N \to p$

g) Mean of Bernoulli Distribution is ________.

i) np    ii) p

iii) npq    iv) pq

h) If $X \sim B(n, p)$ then p.g.f. of X is ________.

i) $(sp + p)^n$    ii) $sp + q$

iii) $(sp + q)^n$    iv) $(sq + p)^n$

i) If X and Y are independent variables then $Cov(0.9X + 0.6, 0.8Y + 0.3)$ is ________.

i) 7.2    ii) 0

iii) 8.1    iv) $7.2Cov(X, Y) + 0.9$

j) The joint p.m.f. of (X, Y) is $P(x, y) = k(2x + 3y)$, where $(x, y) = (1, 1), (1, 2), (2, 1), (2, 2)$, then k = ________.

i) 1/40    ii) 1/32

iii) 1/12    iv) None of these

**Q2)** Attempt Any Two of the following: **[20]**

a) A random variable X has the following probability mass function.

| X | 0 | 1 | 2 | 3 | 4 |
|---|---|---|---|---|---|
| P(x) | 5k | 4k | 3k | 2k | k |

Find:

i) k

ii) P(X is at least 3)

iii) E(X)

iv) V(X)

v) The cumulative distribution function of X.

b) Define binomial distribution. Find its mean and variance.

c) Define expectation of function of bivariate r.v. (X, Y) and show that

i) $E(X + Y) = E(X) + E(Y)$

ii) If X and Y are independent then $E(XY) = E(X) \times E(Y)$

**Q3)** Attempt Any Four from the following: **[20]**

a) With reference to univariate discrete random variable

Define:

i) Median

ii) Mode

iii) Mean

b) Find recurrence relation for obtaining probabilities of hypergeometric distribution.

c) Define cumulative distribution function (c.d.f.) of a discrete random variable and state its important properties.

d) The p.m.f. of discrete random variable X is given by

| x | 1 | 4 | 9 |
|---|---|---|---|
| P(x) | 0.2 | 0.5 | 0.3 |

Find:

i) $E\left(\sqrt{X}\right)$

ii) $E\left(\frac{1}{X}\right)$

iii) E(Y), where $Y = 2X + 2$.

e) How will you determine mean and variance of random variable X by using its p.g.f.?

f) The joint p.m.f. of bivariate r.v. (X, Y) is given by

| x/y | 1 | 2 | 3 |
|---|---|---|---|
| 0 | 0.1 | 0.2 | 0.3 |
| 1 | 0.1 | 0.1 | 0.2 |

Find:

i) $P(X = x / Y = 3)$

ii) $E(X/Y = 3)$

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**Total No. of Pages : 4**

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**B.Sc. (Part - I) (Semester - II) Examination, October - 2017**

**STATISTICS**

**Discrete Probability Distributions (Paper - IV)**

**Sub. Code : 59686**

**Day and Date : Wednesday, 11 - 10 - 2017** **Total Marks : 50**

**Time : 12.00 noon to 2.00 p.m.**

**Instructions :**
1) **All questions are compulsory.**
2) **Figures to the right indicate full marks.**
3) **Use of scientific calculator is allowed.**

**Q1)** Choose the most correct alternative : **[10]**

a) Relate a continuous random variable with one of the following sample space.

i) finite ii) countably infinite

iii) infinite iv) all the above

b) Interpretation of $V(X) = 0$ is ______.

i) X has one point distribution

ii) X takes any single value

iii) X takes only two values $-1$ and 1

iv) Only (i) and (ii) are true

c) Extension of Bernoulli distribution is ______ distribution.

i) Uniform ii) Hypergeometric

iii) Binomial iv) Two point

d) With usual notations, what is an interpretation of N in hypergeometric distribution?

i) Lot size ii) Random variable

iii) Sample size iv) None of the above

e) Select appropriate relation between E(X) and V(X) for binomial distribution.

i) $E(X) = V(X)$ ii) $E(X) < V(X)$

iii) $E(X) > V(X)$ iv) None of these

***P.T.O.***

f) Identify the value of K for the following p.m.f.

$$p(x)=\begin{cases} K & \text{if } x=0,1,2,3 \\ 0 & \text{otherwise} \end{cases}$$

i) 1/4 ii) 1/3

iii) 1/2 iv) 1

g) If E(XY) = E(X) E(Y) then identify the relationship between X and Y?

i) Independent ii) Correlated

iii) Uncorrelated iv) Dependent

h) If X and Y are independent then ______.

i) $P(X = x/Y = y) = P(X = x)$ ii) $P(Y = y/X = x) = P(Y = y)$

iii) $E(XY) = E(X)E(Y)$ iv) All the above

i) If joint p.m.f. r.v. (X, Y) is given by $p(x,y)=\begin{cases} \left(\frac{xy}{9}\right) & \text{if } x, y=1,2 \\ 0 & \text{if otherwise} \end{cases}$

What will be the marginal distribution of r.v. X?

i) Discrete uniform distribution over 1 and 2

ii) Bernoulli distribution

iii) Two point distribution

iv) Both (i) and (ii)

j) Decide appropriate formula for conditional p.m.f. of Y given X.

i) $P(X=x/Y=y)=\frac{P(X=x, Y=y)}{P(X=x)}$

ii) $P(Y=y/X=x)=\frac{P(X=x, Y=y)}{P(X=x)}$

iii) $P(X=y/Y=x)=\frac{P(X=x, Y=y)}{P(X=x)}$

iv) $P(Y=y/X=x)=P(X=x, Y=y)$

**Q2)** Attempt any two of the following : **[20]**

a) If X is univarite discrete random variable (r.v.), then define its :

i) Probability mass function (p.m.f.)

ii) Mean

iii) Median

iv) Mode.

Find mean, median and mode of a r.v. X which is having the following p.m.f. $p(x)$ :

| $x$ | −2 | −1 | 0 | 1 | 2 | 3 |
|---|---|---|---|---|---|---|
| $p(x)$ | 1/16 | 5/16 | 4/16 | 3/16 | 2/16 | 1/16 |

b) Using of probability generating function obtain mean and variance of B($n$, $p$).

c) If (X, Y) is a bivarite random variable (r.v.) having joint p.m.f. p(x, y) then define :

i) marginal p.m.f. of r.v. X,

ii) conditional p.m.f. r.v. X for given value of Y = $y$ and

iii) independence of r.v.s X and Y.

Find conditional probability distribution of r.v. X when Y = 0 for the following joint probability distribution P($x$, $y$) of r.v. (X, Y) :

| $x$\\$y$ | −2 | −1 | 0 | 1 | 2 |
|---|---|---|---|---|---|
| −3 | 5/42 | 4/42 | 3/42 | 2/42 | 1/42 |
| 0 | 3/42 | 3/42 | 0 | 3/42 | 3/42 |
| 3 | 1/42 | 2/42 | 3/42 | 4/42 | 5/42 |

Justify that X and Y are not independent.

**Q3)** Attempt any four of the following : **[20]**

a) Construct a discrete random variable on a sample space of tossing of three coins.

b) Define cumulative distribution function (c.d.f.). State properties of c.d.f.

c) If p.m.f. of r.v. X is given by $p(x)=\begin{cases}\left(\frac{|x|}{10}\right) & \text{if } x=-3,-2,2,3 \\ 0 & \text{if otherwise}\end{cases}$

Find p.m.f. of $X^2$.

d) Prove that variance of r.v. X is independent of change of origin but depends on change of scale transformation.

e) Find the recurrence relation to obtain probabilities of hypergeometric distribution H(N, M, $n$).

f) Show that
$\text{Cov}(aX + bY, cX + dY) = ac\text{V}(X) + bd\text{V}(Y) + (ad + bc)\,\text{Cov}(X, Y)$.

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Total No. of Pages :4

# B.Sc. (Part-I) (Semester-II) Examination, May - 2018
## STATISTICS
## Discrete Probability Distributions (Paper-IV)
## Sub. Code : 59686

**Day and Date : Thursday, 03-05-2018** **Total Marks : 50**

**Time : 12.00 noon to 2.00 p.m.**

**Instructions :**
1) **All questions are compulsory.**
2) **Figures to the right indicate full marks.**
3) **Use of calculator is allowed.**

**Q1)** Choose the most correct alternative: **[10]**

a) For the probability distribution of r. v. X, mode is_________

| X | −1 | 2 | 5 |
|---|---|---|---|
| p(x) | $\frac{1}{3}$ | $\frac{1}{6}$ | $\frac{1}{2}$ |

i) −1 ii) 5

iii) 2 iv) none of these

b) If X has two point distributions with $p(x_1) = p$ and $p(x_2) = q$ then p.g.f. of X is________

i) $px_1 + qsx_2$ ii) $ps^{x_1} + qs^{x_2}$

iii) $p^s x_1 + q^s x_2$ iv) none of these

***P.T.O.***

c) If X and Y are independent Bernoulli variates such that $P(X=0)=P(X=1)$ and $P(Y=0)=P(Y=1)$, then $V(X+Y)$ is________

i) 0      ii) 1

iii) 0.5      iv) 2

d) If $E(X)=4$ and $E(X^2)=25$, then $V(3X-4)=$ _________

i) 5      ii) 9

iii) 81      iv) 27

e) If (X,Y) is bivariate discrete r.v then variables X and Y are independent if__________

i) $\text{cov}(X, Y) = 1$

ii) $p(x,y) = p(x) . p(y)$, for all $(x,y)$

iii) $p(x, y) = p(x)+p(y)$, for all $(x, y)$

iv) none of these

f) The p.g.f. of r.v. X is P(s,)then p.g.f. of X+3 is = _______.

i) $s^3.P(s)$      ii) $P(s) + s^3$

iii) $P(s) +3$      iv) $P(3s)$

g) If X is discrete r.v. with mean E(X), then $E[X - E(X)]^2$ is called _____.

i) mean      ii) second central moment.

iii) s.d.      iv) second raw moment.

h) For Binomial distribution with parameter (n,0.6), mean is 6 then $E(X^2)=$ ______.

i) 2.4      ii) 36

iii) 38.4      iv) none of these

i) The function $f(x) = \frac{2x+5}{21}$ is p.m.f. with the support (range) of the r.v.X is ______.

i) $x = -2, 0, 1$ ii) $x = -1, 0, 1$

iii) $x = 1, 2, 3$ iv) $x = 0, 1, 2$

j) If p.m.f. of X is $P(X = x) = \frac{x}{6}; x = 1, 2, 3$; and equal to zero otherwise, then the mean of X is ______.

i) $\frac{1}{6}$ ii) $\frac{7}{2}$

iii) $\frac{7}{3}$ iv) none of these

**Q2)** Attempt any two of the following **[20]**

a) Define binomial distribution. Obtain p.g.f. of binomial distribution. Also obtain recurrence relation of probabilities of binomial distribution.

b) A discrete random variable X has the following probability distribution,

| X : | -2 | -1 | 0 | 1 | 2 | 4 |
|---|---|---|---|---|---|---|
| P(x) : | 0.1 | K | 0.2 | 2K | 0.3 | 0.1 |

Find: i) K ii) $P(|X| \le 2)$ iii) Mean iv) Variance v) Mode

c) Define marginal probability distribution in case of bivariate discrete r.v. (X, Y). With usual notations prove that:

i) $E(X+Y) = E(X) + E(Y)$

ii) If X and Y are independent then

$$E(X.Y) = E(X).E(Y)$$

**Q3)** Attempt any four of the following: **[20]**

a) With usual notations prove that:

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

ii) $V(aX) = a^2V(X)$

b) Find mean of hypergeometric distribution with parameters ( N, M, n ).

c) The joint probability mass function is given by

$$p(x, y) = \frac{x + 2y}{36}$$

$x = 1, 2, 3$

$y = 0, 1, 2$

Find the marginal probability mass function of X and Y.

d) Define central moments and state the coefficients of skewness kurtosis.

e) Define: i) Mathematical expectation of discrete r.v.

ii) Probability generating function of discrete r.v.

f) Define discrete uniform distribution. Obtain its mean.

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**ST-822**

Total No. of Pages : 3

| Seat No. | |
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# B.Sc. (Part-I) (Semester - II) (CBCS) Examination, May-2019
## STATISTICS
## Discrete Probability Distributions (Paper - IV DSC-8B)
### Sub. Code : 72847

Day and Date : Wednesday, 08 - 05 - 2019 **Total Marks : 50**

Time : 11.00 a.m. to 1.00 p.m.

Instructions :
1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Draw neat labeled diagrams wherever necessary.
4) Use of scientific calculator is allowed.

**Q1)** Select the correct alternative from the following. **[10]**

a) For any two events A&B ______

i) $P(A\cap B^c)=P(B)-P(A\cap B)$

ii) $P(B^c\cap A)=P(B)-P(A\cap B)$

iii) $P(A\cap B)=P(B)-P(A\cap B^c)$

iv) None of the above is true

b) The distribution function of a discrete random variable is _____.

i) Logarithmic function ii) Exponential function

iii) Constant function iv) Step function

c) A random variable is a _____ defined on sample space.

i) Probability ii) Function

iii) Constant iv) Variable

d) If p.g.f of a r. v is $0.5+0.3s+0.2s^2$ then $E(x)$ is_____

i) 1.2 ii) 1

iii) 0.7 iv) 0.5

*P.T.O.*

e) V(ax+b) is _____.

i) a V(x) ii) $a^2V(x)$

iii) V(x) +b iv) $a^2V(x)+b$

f) Mean of Binomial distribution is _____ variance.

i) Less than ii) Greater than

iii) Less than or equal to iv) Greater than or equal to

g) The number of parameters for hypergeometric distribution is _____.

i) 3 ii) 2

iii) 1 iv) 0

h) If a r. v X has discrete uniform distribution taking values 1,2,3,....n & if X has mean 10 then the value of n is _____

i) 18 ii) 20

iii) 19 iv) 10

i) If X and Y are two independent random variable with means 6 and 5 resectively then, E(XY)=_____.

i) 11 ii) 30

iii) 36 iv) 25

j) The cov(X,X) is _____

i) V(X) ii) Mean of X

iii) Zero iv) Constant

**Q2)** Attempt any two of the following. **[20]**

a) Define Discrete Uniform distribution. Find its mean and variance.

b) Define expectation of function of bivariate r.v. (X,Y) and show that

i) E(X+Y) = EX + EY

ii) If X and Y are independent then E(XY) = EX.EY.

c) A discrete random variable X has the following p.m.f.

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

Find

i) k

ii) $P(x \geq 2)$

iii) $P(-2 < X < 2)$

iv) P(X is at least3)

v) c.d.f. of X

**Q3)** Attempt any Four of the following. **[20]**

a) Define probability generating function (p.g.f.) of a random variable. What is the effect of change of origin on p.g.f.

b) The p.m.f. of discrete random variable X is given by,

| X | 1 | 4 | 9 |
|---|---|---|---|
| P(x) | 0.2 | 0.5 | 0.3 |

Find

i) E(X)

ii) V(X)

iii) $E(\sqrt{X})$

c) Define p.m.f. Verify whether the following function can be considered as p.m.f.

P(X=x)=(x+1)/10, x=0,1,2,3.

d) Find recurrence relation for obtaining probabilities of hypergeometric distribution.

e) The joint p.m.f. of bivariate r.v. (x,y) is given by

| X/Y | 1 | 2 | 3 |
|---|---|---|---|
| 0 | 0.1 | 0.2 | 0.3 |
| 1 | 0.1 | 0.1 | 0.2 |

Find

i) Marginal p.m.f. of X and Y.

ii) Are X and Y are independent?

f) Show that $V(aX+b)=a^2v(X)$

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