F.Y.B.SC. SEM – II (CBCS - 2016 COURSE) : SUMMER - 2018

SUBJECT : STATISTICS : DISCRETE PROBABILITY & PROBABILITY DISTRIBUTIONS – II

Day : **Monday**
Date : **23/04/2018**

S-2018-0641

Time : **03.00 PM TO 06.00 PM**
Max. Marks : 60

N.B.:

1) All questions are **COMPULSORY**.
2) Figures to the right indicate **FULL** marks.
3) Use of statistical tables and **CALCULATOR** is allowed.

Q.1 A) Choose the correct alternative for: **[06]**

i) If $X \sim$ Geometric (p), taking values 1, 2, 3,..... then ________.

a) Mean > Variance **b)** Mean = Variance
c) Mean < Variance **d)** Mean = 2 Variance

ii) If $X \to$ Poisson (m = 3), then the standard deviation of X is __________.

a) 3 **b)** $\sqrt{3}$ **c)** 9 **d)** $\frac{3}{2}$

iii) The second central moment of Poisson distribution with mean m is _______.

a) 2 **b)** m **c)** m^3 **d)** m^2

iv) If Cov (X, Y) = 50, then Cov (3X – 5, 2Y + 10) is _______.

a) 50 **b)** 100 **c)** 25 **d)** 300

v) If $X \to$ Geometric $\left(\frac{1}{3}\right)$, taking values 1, 2, 3,...., then variance of X is _____.

a) 6 **b)** 9 **c)** $\frac{1}{9}$ **d)** None of these

vi) If $\rho(X, Y) = 0.5$, then $\rho(3X, -5Y)$ is ______.

a) 0.5 **b)** –0.5 **c)** 1 **d)** 0.75

B) State whether the following statements are true or false: **[06]**

i) Correlation coefficient between (3 – X) and (5 – 3Y) is the same as that between X and Y.

ii) Marginal probability distribution of Y is a univariate probability distribution.

iii) If X is a geometric r.v. taking values 0, 1, 2, ..., then its variance is greater than mean.

iv) If X and Y are independent random variable then $\rho(X, Y) = 0$.

v) Poisson distribution is always unimodal.

vi) Poisson distribution satisfies additive property.

Q.2 Attempt **ANY THREE** of the following: **[12]**

a) Derive moment generating function (m.g.f) of geometric (p).

b) Let X and Y be two discrete r.v.s having joint pmf

$$p(x, y) = kxy \qquad x = 1, 2;\ y = 1, 2$$
$$= 0 \quad , \qquad \text{otherwise}$$

Find : **i)** k **ii)** $P(X + Y > 3)$.

c) Suppose X_1, X_2, X_3 are three discrete r.v.s with means 2, 4, and 5 and s.d.s 2 each. Find : **i)** $E(2X_1 + X_2 + X_3)$ **ii)** $s.d.\left(\frac{X_1 + X_2 + X_3}{4}\right)$.

d) If $X \to$ Poisson (m) such that $P(X = 2) = P(X = 1)$, find $P(X = 4)$.

P.T.O.

Q.3 Attempt **ANY FOUR** of the following: **[12]**

a) If X → Poisson (m) then show that:

$$P(X=x+1)=\frac{m}{x+1}\,P(X=x).$$

b) The probability of a successful launching of a rocket is 0.7. Find the Probability that for the first time a successful launching will be made on the 5th attempt.

c) If X and Y are two independent discrete r.v.s with $\sigma_x^2=9$ and Var (2X + 3Y) = 72, compute σ_y^2.

d) Prove that Cov (X + c, Y + d) = Cov (X, Y), where c and d are constants.

e) The joint p.m.f. of (X, Y) is as follows:

X \ Y	−2	0	2
−1	0.1	0.2	0.1
0	0.2	0.1	0.1
1	0.1	0.1	0

Find F(0, 0) and P(X = 0).

Q.4 Attempt **ANY TWO** of the following: **[12]**

a) Define Geometric distribution. Obtain its mean and variance.

b) The joint p.m.f. of (X, Y) is given by:

$$p(x,y)=\frac{x^2+y^2}{20} \qquad x=-1,1$$

$$y=-2,2$$

$$= \quad 0, \qquad \text{otherwise}$$

i) Obtain marginal p.m.f. of X and Y.
ii) Obtain conditional probability distribution of X given Y = 2.

c) The joint p.m.f. of (X, Y) is

X \ Y	0	1	2
-1	1/6	0	1/12
1	1/4	1/3	1/6

Find : **i)** ρ(X, Y) **ii)** Are X and Y independent.

Q.5 Attempt **ANY TWO** of the following: **[12]**

a) Obtain conditional mean and variance of Y given X = 0 for the following joint probability distribution.

X \ Y	1	2	3
0	0.1	0.2	0.3
1	0.1	0.1	0.2

b) For (X, Y) a bivariate discrete r.v., $\sigma_X^2=9$, $\sigma_Y^2=4$ Cov (X, Y) = 4.

Find: **i)** Var (3X + 5Y) **ii)** Var (2X − Y) **iii)** $Cov\left(\frac{3X}{2},\frac{5Y}{2}\right)$

c) Define Poisson probability distribution. Obtain its mean and variance.

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