BACHELOR OF SCIENCE (CBCS-2018 COURSE)
F. Y. B. Sc. Sem-II :SUMMER- 2022
SUBJECT : STATISTICS : DISCRETE PROBABILITY & PROBABILITY DISTRIBUTIONS-II

Day : Wednesday
Date : 20-07-2022

S-18338-2022

Time : 11:00 AM-02:00 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 Attempt **ANY TWO** of the following: **[12]**

a) Define Poisson distribution. Also state and prove additive property of Poisson distribution.

b) Define geometric distribution and find its mean and variance.

c) A random variable (X, Y) has joint probability mass function (p.m.f.)

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

Find :
i) Marginal distribution of X and Y.
ii) Conditional distribution of X given Y = 1.

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

a) Find first four central moments of Poisson distribution.

b) A joint p.m.f. of (X, Y) is given below:

X \ Y	−2	0	2
−1	0.1	0.2	0.1
0	0.2	0.1	0.1
1	0.1	0.1	0.0

Find : **i)** $P(Y = 2 \mid X = 1)$ **ii)** $P(X + Y \leq 1)$ **iii)** $F(0, 0)$.

c) For the following probability distribution:

X \ Y	2	3	4
1	0.06	0.15	0.09
2	0.14	0.35	0.21

Find : **i)** $E(2X - Y)$ **ii)** $E(XY)$ **iii)** $\rho(X, Y)$

P.T.O.

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

a) Define joint distribution function of bivariate r.v. Also state its properties.

b) Suppose X and Y are two discrete random variables then show that $Var(aX + bY) = a^2 Var(X) + b^2 Var(Y) + 2ab\, Cov(X, Y)$.

c) Let the joint p.m.f. of (X, Y) is
$P(x, y) = k(2x + 5y)$, $x = 0, 1, 2;$ $y = 1, 2, 3$
Find : **i)** k **ii)** $P(X > 1)$

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

a) Explain :
i) Conditional distribution of X given $Y = y_j$.
ii) Conditional distribution of Y given $X = x_i$.

b) State and prove lack of memory property of a geometric distribution.

c) Let $X \rightarrow$ Poisson (m) such that $P(X = 2) = \frac{3}{4} P(X = 1)$. Find $P(X = 0)$ and the most probable value of X.

d) Let the joint p.m.f. of (X, Y) is
$P(x, y) = \frac{1}{4}$, $for\ (x, y) = (0,0), (0,1), (1,0), (1,1)$
Are X and Y independent?

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

a) Give any three real life situations where geometric distribution is applicable.

b) A blood bank need a donor of blood group 'O'. There are 20% donors of blood group 'O'. What is the probability that 5^{th} donor is the first one of blood group 'O'?

c) If $X \rightarrow$ Poisson (2) independent of $Y \rightarrow$ Poisson (3), find:
i) $E(X + Y)$ **ii)** $Var(X + Y)$.

d) If $X \rightarrow$ Poisson (m) such that $\beta_1 = 0.5$, then find $P(X < 1)$.

e) Define covariance between two r.v.s.

f) With usual notations, show that $cov\left(X - \rho\frac{\sigma_x}{\sigma_y}Y, Y\right) = 0$.

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