UNIVERSITY OF COMPUTER & EMERGING SCIENCES
LAHORE
ANSWER
FAST

Course: Probability and Statistics
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Section: BCS-4A
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40.5

(Q1)

(a) ~~Using the hypergeometric distribution.~~

$$P(x) = \frac{\binom{a}{x}\binom{N-a}{n-x}}{\binom{N}{n}}$$

$P(k \leq 2) = 0.6122$

$a = 2$

$N =$

$n =$

Using the Binomial distribution

$$P(x) = \binom{n}{x} p^x q^{n-x}$$

$p = 0.6122$

$q = 1-p = 0.3878$

$n = 20$

$x = 2$

4

For atleast 2:

$P(x \geq 2) = 1 - P(x < 2)$

~~$P < 2$~~

$P(x < 2) = P(0) + P(1)$

$P(0) = \binom{20}{0} p^0 q^{20} = (1)(0.6122)^0 (0.3878)^{20} = 5.9 \times 10^{-9}$

$P(1) = \binom{20}{1} p^1 q^{19} = (20)(0.6122)^1 (0.3878)^{19} = 1.86 \times 10^{-7}$

art No.

Rough Work

$5.9\times10^{-9} + 1.86\times10^{-7} = 1.927\times10^{-7}$

$P(x<2) = 1.927\times10^{-7}$

$1 - P(x<2) = 1 - 1.927\times10^{-7}$

$= 0.9999$

$\boxed{P(x\geq 2) = 99.99\ \%}$

(b)

$E(x) = np$

$= (20)(0.6122)$

$\boxed{E(x) = 12.244}$

2

$\sigma^2 = \text{variance} = npq$

$= \cancel{12.244}\ (12.244)(0.3878)$

$\sigma^2 = 4.7482$

$\boxed{\sigma = 2.1790}$

2

Question: 03

$$f(x) = \begin{cases} cx^2, & 1<x<4 \\ 0, & \text{otherwise} \end{cases}$$

(a) value of c

we know that

$$\int_{-\infty}^{\infty} f(x)\,dx = 1$$

1

$$\int_{1}^{4} cx^2\,dx = 1$$

$$\Rightarrow [c] \left.\frac{x^3}{3}\right|_1^4$$

$$\Rightarrow c\left[\frac{(4)^3}{3} - \frac{(1)^3}{3}\right]$$

$$\Rightarrow c\left[\frac{64}{3} - \frac{1}{3}\right]$$

2

$$\Rightarrow c\left[\frac{63}{3}\right]$$

$$\Rightarrow c[21] = 1$$

1

$$\boxed{c = \frac{1}{21}}$$

rt No.

$$F(x) = \int_x^4 \frac{x^2}{21} = \left.\frac{x^3}{21}\right|_x^4$$

$$= \frac{(4)^3}{21} - \frac{x^3}{21}$$

$$= \frac{1}{21}(64 - x^3) \quad , x \le 4$$

$$F(x) = \begin{cases} \frac{1}{21}(64 - x^3) & , x \le 4 \\ 0 & , x \le 1 \end{cases}$$

0.5

Q / Part No.

Rough Work

Question. 02

X = num of accept. circuits
y = num of succes. tests by first reject.

S = { aa, ar, ra, rr }

(a)

X \ Y	0	1	2
0	0.01	0	0
1	0.09	0.09	~~X~~ 0
2	0	0	0.81

5

(b) Marginal prob distributions (y next page)

x	0	1	2
$g(x)$	0.01	0.18	0.81

1.5

(a) working

~~(a) f(x) = $\binom{n}{x}(0.9)^x (0.1)^{n-x}$~~

aa ; X = 2 , y = 2
ar ; X = 1 , y = 1
ra ; X = 1 ; y = 0
rr ; X = 0 ; y = 0

P(aa) = 0.9 x 0.9
P(ar) = 0.9 x 0.1
P(ra) = 0.1 x 0.9
P(rr) = 0.1 x 0.1

Part No. | Rough Work

(b) Marginal

y	0	1	2
$h(y)$	0.1	0.09	0.81

1.5

(c) $corr(X,Y) = \dfrac{cov(X,Y)}{\sigma_x \sigma_y}$ 1

$cov(X,Y) = E(XY) - E(X).E(Y).$

$E(XY) = (0)(0)(0.01) + \cdots (0).$

$(1)(1)(0.09) + (2)(1)(0)$
$+ (1)(2)(0) + (2)(2)(0.81)$

$= 0.09 + 4(\cancel{0.88}\ 0.81)$

$E(XY) = 3.33$ 2

$E(X) = 0.18 + 2(0.81)$
$E(X) = 1.8$
$E(Y) = 0.09 + 1.62$
$E(Y) = 1.71$ 2

$cov(X,Y) = 3.33 - (1.8)(1.71)$
$= 3.33 - 3.078$
$\boxed{cov(X,Y) = 0.252}$ 2 $\sigma^2 x = 0.18$ 2
$\boxed{\sigma x = 0.4242}$

$\sigma_x^2 = E(x^2) - (E\,x)^2$
$\sigma_y^2 = E(y^2) - (E\,y)^2$

$\sigma^2 x = 0.18 + 4(0.81) - (1.8)^2$
$\sigma^2 x = 3.42$ 2 $- \cancel{(1.8)^2}$
$\cancel{\sigma x = 1.84\ (1.8)^2 = 1.4}$

$\sigma^2 y = E(y^2) - (Ey)^2$
$= 0.09 + 3.24$
$= 3.33 - 2.9241$ $= 0$
$\sigma^2 = 0.4059$
$\boxed{\sigma_y = 0.6371}$ 2 1

formula ?

$corr(X,Y) = \dfrac{0.252}{(0.4242)(0.6371)} \Rightarrow \dfrac{0.252}{} \Rightarrow 0.27029$

Q / Part No.

Rough Work

$e = 0.9323$ 1

interpretation ?