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21255

B. Sc. (Hons.) Mathematics 2nd Semester Examination – May, 2019

REGRESSION ANALYSIS AND PROBABILITY

Paper : BHM-125 Opt-i

Time : Three hours] *[Maximum Marks : 60*

Before answering the questions, candidates should ensure that they have been supplied the correct and complete question paper. No complaint in this regard, will be entertained after examination.

Note : Attempt ***five*** questions in all, selecting ***one*** question from each Unit. Question No. **9** is ***compulsory***.

UNIT – I

1. (a) A student while calculating the coefficient of correlation between two variates X and Y from 25 pairs of observations obtained the following values $N = 25$, $\Sigma X = 125$, $\Sigma Y = 100$, $\Sigma X^2 = 650$ $\Sigma Y^2 = 460$, $\Sigma XY = 508$. It was, detected later on the time of checking that he had copied down two pairs of observations are

X	Y
6	14
8	6

while the correct values are

X	Y
8	12
6	8

btain the correct value of the coefficient of correlation.

(b) Obtain the two lines of regression which are best fit for the following data :

X	1	2	3	4	5	6	7
Y	9	8	10	12	11	13	14

2. (a) The equations of two regression lines obtained in a correlation analysis are $6X + 10Y = 119$ and $2X + 3Y = 12$. The variance of Y is 4 . Find

(i) The mean of X and Y

(ii) Coefficient of correlation

(iii) Variance of X

(iv) Covariance of X and Y

UNIT – V

9. (a) Distinguish between positive and neg correlation.

(b) Fit a st line in the following data :

x	1	2	3	4
y	2	3	4	5

(c) A, B, and C are three mutually exclusive exhaustive events associated with a rand experiment. Find P(A) given that $P(B) = \frac{3}{2}P(A$ and $P(C) = \frac{1}{2}P(B)$.

(d) State Baye's theorem

(e) If $p(x) = \begin{cases} \frac{x}{15}; & x = 1,2,3,4,5 \\ 0 & \text{elsewhere} \end{cases}$

Find $\rho\left(\frac{1}{2} < x < \frac{5}{2} \middle| x > 1\right)$

(f) If $\mu_1^1 = \frac{16}{7}$ and $\mu_2^1 = \frac{40}{7}$, find variance (μ_2)

(ii) The conditional probability distribution of X given $Y = 1$.

(b) Suppose that two - dimensional continuous random variable (X, Y) has joint p. d. f given by :

$$f(x, y) = \begin{cases} 6x^2y, & 0 < x < 1, \quad 0 < y < 1 \\ 0 & \text{elsewhere} \end{cases}$$

(i) Verify that $\int_0^1 \int_0^1 f(x, y)\, dx\, dy = 1$

(ii) Find $P\left(0 < x < \frac{3}{4}, \frac{1}{3} < y < 2\right)$

$P(X + Y < 1)$, $P(X > y)$

and $P(X < 1 | Y < 2)$

8. (a) What is the expectation of the number of failures preceding the first success in an infinite series of independent trails with constant probability p of saccess in each trial ?

(b) The p. d. f of a r. v is given by $f(x) = kxe^{-x^2/2}$, $x \geq 0$, when K is a constant. Evaluate K and obtain mean, median and mode of the distribution.

(b) Fit a least square curve $y = ax^b$ to following data :

x	1	2	3	4	5
y	0.5	2	4.5	8	12.5

UNIT – II

3. (a) An urn contains 6 white, 4 red and 9 black balls. If 3 balls are drawn at random, find the probability that (i) two of the balls are white, (ii) one of each colour (iii) none is red (iv) at least one is white.

(b) State and prove Boole's inequality.

4. (a) A letter is taken out at random out of "ASSISTANT" and a letter out of "STATISTIC". What is the chance that they are the same letters ?

(b) Give the classical and statistical definitions of probability. What are the objections raised in these definitions ?

UNIT – III

5. (a) The probabilities of X, Y, and Z becoming managers are $\frac{4}{9}$, $\frac{2}{9}$ and $\frac{1}{3}$ respectively. The

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probabilities that the Bonus scheme will be introduced if x, y and z becomes managers are $\frac{3}{10}, \frac{1}{2}$ and $\frac{4}{5}$ respectively.

(i) What is the probability that Bonus scheme will be introduce, and

(ii) If the Bonus scheme has been introduced , what is the probability that manager appointed was X ?

(b) A random variable X has the following probability distribution :

x	0	1	2	3	4	5	6	7	8
p(x)	k	3k	5k	7k	9k	11k	13k	15k	17k

(i) Determine the value of k.

(ii) Find $P(X<3), P(X\geq 3), P(0<X<5)$

(iii) What is the smallest value of x for which $P(x \leq x) > 0.5$?

(iv) Find the distribution function of X.

6. (a) A r. v X has the density function :

$$f(x)=\begin{cases}\frac{1}{4}, & -2<x<2\\ 0 & \text{elsewhere}\end{cases}$$

Obtain

(i) $P(x<1)$

(ii) $P(1\times 1>1)$

(iii) $P(2\times + 3>5)$

(b) Explain what is meant by a random vari Distinguish between a discrete and a contin random variable. Define distribution function random variable.

UNIT – IV

7. (a) The joint probability distribution of two rand variables X and Y is given by $P(X=0, Y = \frac{1}{3}$, $P(x=1, y=-1)\ \frac{1}{3}$, $p(X=1, y=1)$ - Find

(i) Marginal distribution of X and Y and

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