KATHMANDU UNIVERSITY
End Semester Examination
March/April, 2017

Marks Scored:

Level : B.Sc.
Year : II

Course : STAT 201
Semester : I

Exam Roll No. :

Time : 30 mins.

F. M. : 20

Registration No. :

Date : MAR 2 4 2017

SECTION "A"

[10 Q. × 1 = 10 marks]

Fill in the blanks space(s) by most appropriate word(s) or symbol(s).

1. The conditional distribution of Y given $X = x$, $\Pr(Y = y \mid X = x)$, is.....

2. The joint distribution of X and Y is given b$f(x,y) = \frac{x+y}{21}, x = 1,2,3; y = 1,2$. This can be represented in the tabular form .....

3. The marginal distribution of X defined in Question No. (2) is given by .....

4. The mean of X defined in Question No. (2) is given by .....

5. The probability distribution of $Y = (X-1)^2$ where X is the number of head in two tosses of a fair coin is .....

6. The cumulative distribution function F(x, y) lies between ..... and .....

7. The joint cumulative distribution function F(x, y) = ...

8. If X and Y are independent random variables the $f_{X,Y}(x,y) = \cdots \ldots \ldots \ldots$

9. If X and Y are independent random variables then the condition distribution of X given Y, that is $f_{X|Y}(x|y) = \cdots \ldots \ldots$

10. E(y|x) is called the ..... of y and x.

SECTION "B"

[10 Q. × 1 = 10 marks]

11. The joint distribution of (X, Y) is equivalent to probability .....
    a. P(X = x, Y = y)
    b. $P(X \le x, Y \le y)$
    c. $P(X \le x, Y = y)$
    d. $P(X \ge x, Y \ge y)$

12. The conditional expectation of Y given X, $E(Y \mid X = x)$, is calculated as follows:
    a. $\sum_{i=1}^{k} y_i \Pr(X = x_i \mid Y = y)$
    b. $E[E(Y \mid X)]$
    c. $\sum_{i=1}^{k} y_i \Pr(Y = y_i \mid X = x)$
    d. $\sum_{i=1}^{l} E(Y \mid X = x_i) \Pr(X = x_i)$

13. If X and Y are two independent random variables, the cumulative distribution function F(x, y) is equal to.....

a. $F_1(x)\ F_2(y)$ b. $P(X \leq x, Y \leq y)$ c. both a and b d. $P(X \leq x, Y \geq y)$

14. E(Y |X = x) is called .....

a. regression curve of x on y
b. regression curve of y on x
c. both a and b
d. Least square estimate

15. In Central Limit Theorem, the random variables $X_1, X_2 \ldots X_n$ are assumed to be.....

a. Independent
b. Identical distributed
c. a & b
d. Normally Distributed

16. Central Limit Theorem is developed by .....

a. De-Morive b. Laplace c. Lindeberg-Levy d. Chebyshev

17. If two events (A, B) are independent, their joint probability is given by .....

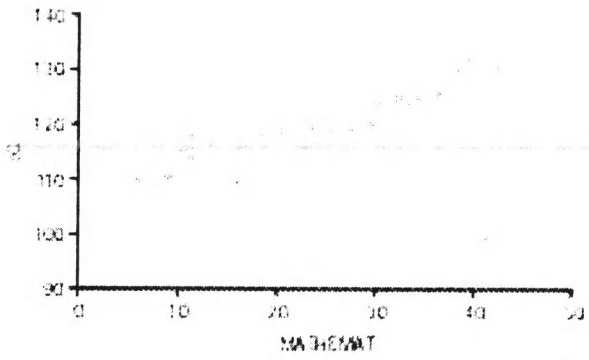
a. P(AB) = P(A)*P(B)
b. P(AB) = P(A)*P(B) - P(A or B)
c. P(AB) = P(A)*P(B) + P(A or B)
d. P(AB) = P(A) + P(B)

18. If two variables are totally independent, then the correlation between them is:.....

a. -0.1 b. -1.00 c. +1.00 d. Zero

19. If the covariance between two random variables X and Y is zero then .....

a. X and Y are independent
b. Knowing the value of X provides no information about the value of Y
c. E(X) = E(Y) = 0
d. Nothing can be stated about dependence or independence



20. Look at the scatter gram:

Which is the most sensible answer? The variables show a correlation of:

a. -1.00 b. +1.00 c. -0.7 d. +0.7

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F. M. : 55

SECTION "C"

[3Q. × 7 = 21 marks]

1. A catalyst researcher states that the diameter in micron of the pores in a new product she has made have exponential distribution with parameter $\lambda = 0.25$. [2 + 1+ 2 + 2]
   a. What is the mean pore diameter?
   b. What proportion of pores is less than 3 micron in diameter?
   c. What is the third quartile of the pore diameter?
   d. What is the 99 th percentile of the pore diameter?

2. If the joint density of X_1 and X_2 is given by

$$f(x_1, x_2) = \begin{cases} 6e^{-3x_1-2x_2} & \text{for } x_1 > 0, x_2 > 0 \\ 0 & \text{otherwise} \end{cases}$$

   Find the density of $Y = X_1 + X_2$ also find E(Y). [5+2]

3. The joint probability density function of the random variable X and Y is

$$f(x, y) = \begin{cases} 6x & 0 < x < 1, 0 < y < 1 - x \\ 0, & \text{otherwise} \end{cases}$$

   i. Show that X and Y are not independent
   ii. Find P(X>0.3|Y = 0.5) [4 + 3]

SECTION "D"

[6Q.× 4 = 24 marks]

4. Show that the angle between the two lines of regression is

$$\theta = \tan^{-1}\left[\frac{1-\rho^2}{\rho}\frac{\sigma_X\sigma_Y}{\sigma_X^2+\sigma_Y^2}\right]$$

   Where ρ is the coefficient of correlation between X and Y

5. The joint probability distribution of X and Y is given below

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

   Find the correlation coefficient of (X, Y)

6. Obtain the regression lines of X and Y for the data given in Question No. (5)

7. If X is a random variable with probability density function

$$f(x) = \begin{cases} \theta e^x e^{-\theta e^x} & \text{if } x > 0 \\ 0 & \text{otherwise} \end{cases}$$

   and, $Y = e^X$, find (a) the distribution function of Y and (b) the PDF of Y

8. If the random variables X and Y have the joint probability density function given by

$$f(x,y) = \begin{cases} xe^{-x(y+1)} & \text{if } x \geq 0, y \geq 0 \\ 0 & \text{otherwise} \end{cases}$$

Find the regression curve of Y on X.

9. If $X_1, X_2, \ldots, X_n$ are Poisson variables with parameter $\lambda = 3$, use the central limit theorem to estimate $P(260 \leq S_n \leq 320)$, where $S_n = X_1 + X_2 + \cdots \ldots \ldots + X_n$, $n = 100$.

SECTION "E"

[5Q.× 2 = 10 marks]

10. If the equations of the two lines of regression of Y on X and X on Y are respectively, $7x - 16y + 9 = 0$ and $5y - 4x - 3 = 0$, calculate the coefficient of correlation, E(X) and E(Y).

11. If $y = 2x - 3$ and $y = 5x + 7$ are the two regression lines, find (i) the mean values of X and Y, (ii) the correlation coefficient between X and Y, and (iii) find an estimate of X for Y = 1

12. From the given data, find the two regression lines using scientific calculator.

Marks in Economics	25	28	35	32	31	36	29	38	34	32
Marks in Statistics	43	46	49	41	36	32	31	30	33	39

13. Interpret these two regression lines obtained in Question (12)

14. Given the random variable X with probability density function
$f(x) = 2x$, if $0 < x < 1$
Find the probability density function of $Y = 8X^3$