KATHMANDU UNIVERSITY
End Semester Examination
February/March, 2018

Marks Scored:

Level: B. Sc.
Year : II

Course : STAT 201
Semester : I

Exam Roll No. :

Time: 30 mins.

F. M. : 20

Registration No.:

Date FEB 2 7 2018

SECTION "A"
[10 Q. × 1 =10 marks]

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

1. The joint probability is.....
   a) The likelihood of two events happening together
   b) The likelihood of an event happening given that another event has already happened
   c) Based on two mutually exclusive events
   d) Also called Prior probability

2. If X and Y are independent random variables then E(XY) is equal to .....
   a) E(X)+E(Y) b) X.E(Y) c) E(X).Y d) E(X)E(Y)

3. If *X* is a continuous random variable, then function *f(X)* is.....
   a) Distribution Function b) Probability Density Function
   c) Probability Mass Function d) Probability Function

4. If r = 0.6, b_{yx} = 1.2 then b_{xy}=.....
   a) 0.3 b) 0.2 c) 0.72 d) 0.40

5. The Joint Cumulative Density Function (CDF) .....
   a. Is a non-negative function
   b. Is a non-decreasing function of x & y planes
   c. Is always a continuous function in xy plane
   d. All of the above

6. When do the conditional density functions get converted into the marginally density functions ?.....
   a. Only if random variables exhibit statistical dependency
   b. Only if random variables exhibit statistical independency
   c. Only if random variables exhibit deviation from its mean value
   d. None of the above

7. What would happen if the two events are statistically independent ?.....
   a. Conditional probability becomes less than the elementary probability
   b. Conditional probability becomes more than the elementary probability
   c. Conditional probability becomes equal to the elementary probability
   d. Conditional as well as elementary probabilities will exhibit no change

8. Consider the assertions given below:.....
A : CDF is a monotonously increasing function
B : PDF is a derivative of CDF & is always positive
Which among them is correct according to the properties of PDF?
a. A is true & B is false
b. A is false & B is true
c. Both A & B are true but B is a reason for A
d. Both A & B are false since B is not a reason for A

9. 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) neither a nor b

10. If X and Y are two independent rv's, 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. neither a nor b

SECTION "B"

[10 Q. × 1 = 10 marks]

Fill in the blanks.

11. If two variables oppose each other then the correlation will be.....

12. The joint probability mass function of (X, Y) is given by p(x, y) = k (4x+4y), x = 1, 2, 3 ; y = 0, 1, 2. Then the marginal of Y is .....

13. In the previous question 12, $P(X \leq 2|Y \leq 1)$ =.....

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

15. Joint cumulative distribution function F(x, y) = ...

16. E(x|y = y) is called ..... of x given y.

17. If X and Y are independent the Cov (X, Y) is .....

18. What type of control chart would be used to monitor the number of defects in the output of a process for making rope?.....

19. What type of control chart would be used to monitor the number of defectives in the output of a process for making iron castings?.....

20. When the sample size increases, everything else remaining the same, the width of a confidence interval for a population parameter will.....

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SECTION "C"

[3Q.× 7 = 21 marks]

1. If X and Y have the joint probability density function given by $f(x,y) = (x+y)/21$, $x = 1, 2, 3$; $y = 1, 2$ Obtain (i) the correlation coefficient ρ_{xy} (ii) $E(X|Y = 2)$ [5+2]

2. The distance between flaws on a long cable is exponentially distributed with mean 12 m. [2+2+2+1]
   a. Find the probability that the distance between two flaws is greater than 15m.
   b. Find the probability that the distance between two flaws is between 8 and 20 m.
   c. Find the median distance.
   d. Find the 65th percentile of the distance

3. Let X denote the amount of copper and let Y denote the amount of nickel, in parts per ten million, in randomly selected bottle of solution. Assume that the joint probability density function of X and Y is given by
   $$f(x,y) = c(x+y)^2, 0 < x < 1 \text{ and } 0 < y < 1$$
   a. Find the value of constant c so that f(x, y) is a joint density function.
   b. Compute the marginal density function $f_X(x)$
   c. Compute the conditional expectation $E(Y|X = 0.4)$
   d. Are X and Y independent? Explain [2+2+2+1]

SECTION "D"

[6Q. × 4 = 24 marks]

4. X and Y are random variables with the joint probability density function $f(x, y) = (x+2y)/18$, where $(x, y) = (1, 1), (1, 2), (2, 1), (2, 2) = 0$, elsewhere. Are the variables independent?

5. Given $f(x, y) = \frac{c_1 x}{y^2}$, $0 < x < y < 1$ and $f_2(y) = c_2 y^4$ obtain c_1, c_2 and also get the joint probability density function.

6. If X is a random variable with the exponential density
   $f(x) = \{\theta e^{-\theta x} \quad for \quad x > 0\}$
   and $Y = X^2$, find i) the distribution function of Y and ii) the probability density of Y [2+2]

7. If the joint probability density function of X and Y is given by
   $$f(x,y) = \{24xy \quad for \quad 0 < x < 1, \quad 0 < y < 1, \quad x + y < 1 \quad \}$$
   find $P(X+Y<1/2)$.

8. The calculations of the ages of several sediments sample taken at various depths (in cm) are given below. [2+2]

Depth	Age
284.5	125.5
407.5	3390
512.0	5560
551.0	6670
578.5	7160
697.0	9820
746.5	11030

a. Compute the least squares line for predicting age from depth.
b. Predict the age for a specimen whose depth is 600 cm

9. 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.

SECTION "E"
[5Q.× 2 = 10 marks]

10. Let X be a continuous random variable with PDF

$$f(x) = \left\{ \frac{x}{12} \quad if \quad 1 < x < 5 \right\}$$

Find the probability density function of Y = 2X-3.

11. The joint density function of two continuous random variable X and Y is

$$f(x) = \{Cxy, \quad 0 < x < 4, \quad 1 < y < 5\}$$

Find the value of the constant C.

12. For the Q.11 find the Find $P(X \geq 3, Y \leq 2)$.

13. The number of hits on a website follows a Poisson distribution, with a mean of 27 hits per hour. Find the probability that there will be 90 or more hits in three hours.

14. The life time of a certain battery is modeled with the Weibull distribution with $\alpha = 2$ and $= 0.1$. What proportion of batteries will last longer than 10 hours?