K26FY1402 Pages: 2 Reg No:.................

Name:.................

Second Semester FYUGP Degree (Reg/Sup/Imp) Examination April 2026

KU2DSCSTA131 - PROBABILITY AND RANDOM VARIABLES

2024 Admission onwards

Time : 2 hours Maximum Marks : 70

Section A

Answer any 6 questions. Each carry 3 marks.

1. From a pack of 52 cards, two cards are drawn at random. Obtain the probability that they are a queen and an ace.
2. State mathematical definition of probability.
3. How do you determine whether a linear or quadratic equation is a better fit for the given data?
4. Distinguish between correlation and regression.
5. Explain how the clustering pattern in a scatter diagram can indicate the strength of the correlation. Provide examples of both a strong and a weak corelation.
6. Define marginal distributions. Let X and Y be are discrete random variables with joint probability distribution as follows,

$X \setminus Y$	1	2	3
1	0.10	0.20	0.10
2	0.15	0.10	0.18
3	0.02	0.05	0.10

Find the marginal distributions.

7. Define a bivariate distribution and explain in what respect it is different from univariate distribution.
8. Define marginal distribution and conditional distribution.

Section B

Answer any 4 questions. Each carry 6 marks.

9. Fit a straight line of the form $y = ax + b$ to the following data:

X	1	2	3	4	5	6	7
Y	7	13	19	25	32	40	50

10. Find the slope a and intercept b of the line that fits the data:

X	-2	-1	0	1	2
Y	-1.8	-0.9	0.2	1.0	2.2

11. Fit a regression line to the data:

X	1	3	5	7	9
Y	2	2.5	3	3.5	4

12. Define marginal distributions. The joint probability density function of a two-dimensional random variable (X, Y) is given by $f(x, y) = \begin{cases} 2; & 0 < x < 1; 0 < y < x \\ 0. & \text{elsewhere} \end{cases}$

Find the marginal density function of X.

13. If $f(x, y) = \begin{cases} k(x + y + xy); & 0 < x < 1, 0 < y < 1 \\ 0. & \text{otherwise} \end{cases}$

Determine
(i) k
(ii) marginal density functions of X and Y.
(iii) conditional density function of X given Y.

14. If $f(x, y) = cx(1 - y)$, $0 < x < y < 1$, find
(a) c
(b) the marginal distributions
(c) conditional distributions
(d) also examine whether the variables are independent.

Section C

Answer any 2 questions. Each carry 14 marks.

15. A random variable X has the following probability function,

X	0	1	2	3	4	5	6	7
$p(x)$	0	k	$2k$	$2k$	$3k$	k^2	$2k^2$	$7k^2 + k$

(a) Find k.
(b) Evaluate $P(X < 5)$ and $P(X \geq 5)$.
(c) If $(X < a) > 1/2$, find the minimum value of a.
(d) Determine the distribution function of X.

16. A random variable X has the p.d.f. $f(x) = 6x(1 - x)$, $0 \leq x \leq 1$.
(a) Check that $f(x)$ is p.d.f.
(b) Determine the number $'b'$ such that $P(X < b) = P(X > b)$.
(c) Find the distribution function of X.

17. (a) Define independent events and mutually exclusive events.
(b)Two fair dice are rolled. Find the probability that
(a) Both the dice show number 6
(b) the sum of numbers obtained is 7 or 10
(c) the sum of the numbers obtained is less than 11
(d) the sum is divisible by 3
(e) Both the dice show prime numbers.