K26FY1611 Pages: 2 Reg No:.....
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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. Define different types of random variable with examples.

2. What do you mean by probability distribution of a random variable?

3. Two random variables X and Y have the joint p.d.f.
$f(x,y) = \begin{cases} k(x^2+y^2), & 0<x<2, 1<y<4 \\ 0, & \text{otherwise} \end{cases}$,
Find k.

4. If X assume values 1, 2, 3 with probabilities 1/4, 1/4, 1/2 and Y assume values 1 and 2 with probabilities 1/3 and 2/3, prepare their joint probability distribution, given that X and Y are independent.

5. Define marginal distribution and conditional distribution.

6. If A, B and C are any three events, write down the theoretical expression for the following events: (i) Only A occurs (ii) A and B occur but C does not occurs.

7. If A is any event in the sample space S, show that $P(A^c) = 1 - P(A)$.

8. The probability that India wins a one-day cricket match against Australia is 2/3. India and Australia played 3 one- day cricket matches, what is the probability that India will lose all three matches?

Section B

Answer any 4 questions. Each carry 6 marks.

9. Two fair dice are tossed simultaneously. Let X denote the sum of numbers shown by the two dice and Y denote the absolute value of their difference. Obtain the joint probability mass function of (X, Y). Also find
(a) $P(X = 4, Y = 2)$ (b) $P(X = 8, Y \geq 3)$ (c) $P(X < Y)$

10. Given $f(x,y) = c(xy^2 + e^x)$; $0 < x < 1$; $0 < y < 1$ is a joint p.d.f. Find
(i) c (ii) marginal distribution of X and Y (iii) $P(\frac{1}{2} < X < \frac{2}{3})$ (iv) $P(X < \frac{1}{2}, Y < \frac{1}{4})$.

11. If $f(x,y) = 6x^2y$, $0 < x < 1$, $0 < y < 1$, find
(i) $P(0 < X < \frac{3}{4}, \frac{1}{3} < Y < 1)$
(ii) $P(0 < X < \frac{3}{4} | \frac{1}{3} < Y < 1)$.

12. For any two events A and B, show that $P(A^c \cap B) = P(B) - P(A \cap B)$.

13. An urn contains 2 balls. It is known that the urn was filled by tossing a fair coin twice and putting a white ball in the urn for each head and a black ball for each tail. A ball is drawn from the urn and is found to be white. Find the probability that the other ball in the urn is white.

14. If A , B and C are mutually independent events then show that $A \cup B$ and C are also independent.

Section C

Answer any 2 questions. Each carry 14 marks.

15. (a) Fit a straight line to the data:

x	1	2	3	4	5
y	2.0	4.1	6.2	8.0	9.9

(b) Fit a parabola to the dataset of time (x) and distance covered (y):

x	1	2	3	4	5
y	5.1	7.2	9.8	13.5	18.0

16. Calculate the value of the Pearson's coefficient of correlation for the following data:

x	52	73	33	39	68	55	98	19	62	44
y	51	42	21	41	48	39	91	36	75	33

17. Two coins are tossed and let X represents the number of heads produced. Determine the probability distribution and the distribution function of X. Also find $P(X > 0)$ and $P(X > 1)$.

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