

Second Semester FYUGP Degree (Reg) Examination April 2026

KU2DSCCMT113 - MATHEMATICS FOR DATA SCIENCE

II

2024 Admission onwards

Answer Keys

Time : 2 hours

Maximum Marks : 70

Section A

Answer any 6 questions. Each carry 3 marks.

1. Write the matrix form of the system of equations:

$$\begin{aligned} 2x + 3y - z &= 1 \\ -x + z &= 3 \\ -x + y + z &= 0 \end{aligned}$$

M1:U:Q1:CO1

Answer: answer hint

2. In the LU decomposition of a matrix A , $L = \begin{pmatrix} 1 & 0 & 0 \\ 2 & -1 & 0 \\ 1 & 1 & -1 \end{pmatrix}$ and $U = \begin{pmatrix} 2 & 3 & -2 \\ 0 & -1 & 3 \\ 0 & 0 & 2 \end{pmatrix}$.

Then find determinant of A .

M1:U:Q5:CO1

Answer: answer hint

3. Define subspace of a vector space.

M3:U:Q1:CO1

Answer:

4. Find span S , where $S = \{(1, 0), (0, 1)\}$.

M4:U:Q2:CO1

Answer:

5. What is meant by dimension of a vector space?

M4:U:Q3:CO1

Answer:

6. Compute the probability of obtaining at least two "sixes" in rolling a fair die 4 times.

M7:U:Q5:CO1

Answer:

7. Give 2 examples for continuous random variables and discrete random variables.

M7:U:Q2:CO1

Answer:

1

8. During a war, 1 ship out of 9 was sunk on an average. in making a certain voyage. What was the probability that exactly 3 out of a convoy of 6 ships would arrive safely?

M8:U:Q4:CO1

Answer:

Section B

Answer any 4 questions. Each carry 6 marks.

9. Write the zero vector, additive identity and additive inverse of an element in the vector space $M_{2 \times 3}(\mathbb{R})$ under usual addition and scalar multiplication of matrices.

M3:U:Q1:CO1

Answer:

10. Prove that the set of all upper triangular matrices of order 3 is a subspace of $M_{3 \times 3}(\mathbb{R})$

M3:U:Q4:CO1

Answer:

11. Show that the set of vectors $(1, 1, 0)$, $(1, 0, 1)$ and $(0, 1, 1)$ generate $\mathbb{R}^3$.

M4:U:Q2:CO1

Answer:

12. Find the critical points of $f(x, y) = 3y^2 - 2y^3 - 3x^2 + 6xy$.

M7:U:Q1:CO1

Answer:

13. Let X denote the number of scores on a test. If X is normally distributed with mean 100 and S.D 15, find the probability that X does not exceed 130.

M8:U:Q4:CO1

Answer:

14. Six dice are thrown 729 times. How many times do you expect at least 3 dice to show a five or six?

M8:U:Q1:CO1

Answer:

Section C

Answer any 2 questions. Each carry 14 marks.

15. (a) Find all second order partial derivatives of the function $f(x, y) = xe^y + y \sin x$.
(b) Verify that $w_{xy} = w_{yx}$, where $w = e^x + x \ln y + y \ln x$.

M5:U:Q1:CO1

Answer:

16. Find the values of $\frac{\partial z}{\partial x}$ and $\frac{\partial z}{\partial y}$ at the given points:

1. $\frac{1}{x} + \frac{1}{y} + \frac{1}{z} = 1$ at $(2, 3, 6)$.
2. $xe^y + ye^z + ze^x - 2 - 3 \ln 2 = 0$ at $(1, \ln 2, \ln 3)$.

M5:U:Q4:CO1

Answer:

2

17. Solve using Gauss-Seidel iteration method for 4 iterations:

$$\begin{aligned} 4x - y + z &= 4 \\ -x + 4y - z &= 2 \\ x - y + 4z &= 4 \end{aligned}$$

M1:UC3C4:Q3:CO1

Answer: answer hint