

END SEMESTER EXAMINATION, JUNE- 2025**B. Sc. (Hons.) in Data Science Semester - II****Course Name: Environmental Studies****Course Code: MD121T****Time allotted: 03 Hours****Max. Marks: 100****Note: Read all the instructions carefully.****Q.1. Attempt all.****(10×2=20)**

QN	Questions	CO	PO
a.	Define ecosystem.	1	7
b.	Name the second and third layer of atmosphere.	1	7
c.	Give two examples of non-conventional energy resources.	3	7
d.	Coal is an example of fossil fuel. (True/False)	3	7
e.	Write criteria for hotspots of biodiversity.	1	7
f.	Name two national parks in Uttarakhand.	1	7
g.	Kyoto Protocol was held in _____.	2	7
h.	Write any two causes of global warming.	2	12
i.	Define overpopulation.	2	12
j.	Water pollution control act was enacted in 1986. (True/False)	2	7

Q.2. Attempt any five out of Seven.**(5×4=20)**

QN	Questions	CO	PO
a.	Write short note on biosphere.	2	7
b.	Write four characteristics of a desert ecosystem.	2	7
c.	Brief the causes of land degradation.	2	12
d.	What are the effects of noise pollution on humans?	4	7
e.	Differentiate between in-situ and ex-situ biodiversity conservation.	4	7
f.	Write a short note on global environmental issues.	2	12
g.	Brief are the effects of overpopulation on environment.	2	12

Q.3. Attempt any three out of four.**(3×10=30)**

QN	Questions	CO	PO
a.	Explain the objectives of sustainable development.	1	6,12
b.	Describe the cycling of matter in an ecosystem.	2	7
c.	Discuss the role on an individual in conservation of natural resources.	3	3
d.	Brief the concept of biodiversity and its importance.	4	12

Q.4. Attempt any two out of three.**(2×15=30)**

QN	Questions	CO	PO
a.	Describe various approaches to manage solid waste.	4	7
b.	i) Explain the causes of climate change.	2	7
	ii) Discuss the significance of environmental communication.	4	10
c.	Explain your environmental field visit experiences in detail.	3	12

END SEMESTER EXAMINATION, JUNE- 2025**B. Sc. (Hons.) in Data Science Semester – II****Course Name: Linear Algebra****Course Code: BD122T****Time allotted: 03 Hours****Max. Marks: 100****Note: Read all the instructions carefully.****Q.1. Objectives Type****(10 X 2=20)**

- (Very short/ Short Answer, MCQ, One-liners, Fill in the Blank, True/ False) Attempt all.
- a. Define elementary matrix. CO1
 - b. What is Augmented Matrix? CO1
 - c. Define Rank and Nullity of a matrix. CO1
 - d. Write Gram-Schmidt process formula for $R^4(R)$. CO1
 - e. Define Isomorphism. CO1
 - f. Explain linear combination and linear span. CO2
 - g. Explain algebraic multiplicity and geometric multiplicity. CO2
 - h. Explain inner product space and write its properties. CO2
 - i. Explain Define different types of matrices. CO2
 - j. What is minor and cofactor for a matrix? Give example. CO2

Q.2. Short notes / Short Answer Type (Attempt any five out of Seven)**(5 X 4=20)**

- a. Normalize a vector $v = (2, 2, -1)$ CO3
- b. Find Eigen values and Eigen vectors: CO3

$$A = \begin{pmatrix} 8 & -8 & -2 \\ 4 & -3 & -2 \\ 3 & -4 & 1 \end{pmatrix}$$

- c. Find the basis and dimension of the solution space of the system of linear equations: CO3
$$\begin{aligned} x + 2y - 2z + 2s - t &= 0 \\ x + 2y - z + 3s - 2t &= 0 \\ 2x + 4y - 7z + s + t &= 0 \end{aligned}$$

- d. (i) Express $(7, 8, 9)$ as a linear combination of $u = (2, 1, 4)$, $v = (1, -1, 3)$, $w = (3, 2, 5)$. CO3

- (ii) Find the coordinate vector of P relative to the basis $S = \{p_1, p_2, p_3\}$:
 $p = 3 - x - 2x^2$, $p_1 = 1 + x$, $p_2 = 1 - x^2$, $p_3 = x + x^2$

- e. Find Eigen values and vectors for the matrix CO4

$$A = \begin{bmatrix} 3 & -1 & -1 \\ -1 & 5 & -1 \\ 1 & -1 & 3 \end{bmatrix}$$

- f. Find the inverse $T^{-1}(x_1, x_2, x_3)$ if $T(x_1, x_2, x_3) = (3x_1 + x_2, -2x_1 - 4x_2 + 3x_3, 5x_1 + 4x_2 - 2x_3)$. CO4
- g. Analyze the inverse of the transformation T: CO4

$$A = \begin{pmatrix} 2 & 6 & 10 \\ 0 & 1 & -1 \\ 2 & 4 & 6 \end{pmatrix}$$

P.T.O./-

Q.3. Structured Question (Attempt any three out of four)**(3 X 10=30)**

- a. Let $T: \mathbb{R}^2 \rightarrow \mathbb{R}^3$ be the linear transformation defined by

CO4

$$T\left(\begin{bmatrix} x_1 \\ x_2 \end{bmatrix}\right) = \begin{bmatrix} -x_2 \\ -5x_1 + 13x_2 \\ -7x_1 + 16x_2 \end{bmatrix}$$

Find the matrix for the transformation T with respect to the bases $B = \{u_1, u_2\}$ for $\mathbb{R}^2$ and $B' = \{v_1, v_2, v_3\}$, for $\mathbb{R}^3$.where:

$$u_1 = \begin{bmatrix} 3 \\ 1 \end{bmatrix}, \quad u_2 = \begin{bmatrix} 5 \\ 2 \end{bmatrix},$$

$$v_1 = \begin{bmatrix} 1 \\ 0 \\ -1 \end{bmatrix}, \quad v_2 = \begin{bmatrix} -1 \\ 2 \\ 2 \end{bmatrix}, \quad v_3 = \begin{bmatrix} 0 \\ 1 \\ 2 \end{bmatrix}$$

- b. Verify Cayley-Hamilton theorem for:

CO4

$$A = \begin{bmatrix} 1 & 2 \\ -1 & 3 \end{bmatrix}$$

- c. Find the inverse of matrix by ERO.

CO5

$$A = \begin{bmatrix} -2 & 2 & -3 \\ 2 & 1 & -6 \\ -1 & -2 & 0 \end{bmatrix}$$

- d. Convert the matrix into Reduced Row Echelon Form (RREF):

CO5

$$\begin{bmatrix} 0 & 0 & -2 & 0 & 7 & 12 \\ 2 & 4 & -10 & 6 & 12 & 28 \\ 2 & 4 & -5 & 6 & -5 & -1 \end{bmatrix}$$

Q.4. Long Answer / Essay type (Attempt any two out of three)**(2 X 15=30)**

- a. Find the diagonal matrix of

CO5

$$A = \begin{bmatrix} 4 & 2 & 0 \\ 2 & 1 & 0 \\ 1 & 1 & 7 \end{bmatrix}$$

- b. Using ERO, solve the system of linear equations:

CO6

$$x + y + 2z = 9$$

$$2x + 4y - 3z = 1$$

$$3x + 6y - 5z = 0$$

- c. Apply Gram-Schmidt process to the vectors:

CO6

$$u_1 = (1, -2, 3, -4), u_2 = (2, 1, -4, 3), u_3 = (-3, 4, 1, -2), u_4 = (4, 3, 2, 1),$$

to obtain an orthonormal basis for $\mathbb{R}^4(\mathbb{R})$ with standard inner product space.

END SEMESTER EXAMINATION, JUNE- 2025

B. Sc. (Hons.) in Data Science Semester – II

Course Name: Probability and Distribution Theory

Course Code: BDS122

Time allotted: 03 Hours

Max. Marks: 100

Note: Read all the instructions carefully.

Q.1. Objectives Type

(10 X 2=20)

(Very short/ Short Answer, MCQ, One-liners, Fill in the Blank, True/ False) Attempt all.

a.	Event and outcome of a random experiment. (CO 1, PO 1)
b.	Write down mean and variance Bernoulli distribution. (CO 4, PO 2)
c.	If A, B, C are three arbitrary events. Find expression for 'only A occurs'. (CO 2, PO 2)
d.	Condition probability theorem of probability for any two events A and B. (CO 2, PO 1)
e.	Formula for marginal probability density function of random variable X from f(X,Y). (CO 5, PO 1)
f.	Var (X+c)=....., where c is a constant. (CO 3, PO 2)
g.	Write down probability mass function of Binomial distribution. (CO 4, PO 2)
h.	Define addition theorem of probability. (CO 2, PO 2)
i.	Explain mathematical expectation of a random variable X. (CO 5, PO 1)
j.	Formula for finding expectation of a continuous random variable X. (CO 3, PO 2)

Q.2. Short notes / Short Answer Type (Attempt any five out of Seven)

(5 X 4=20)

a.	For events A and B, P(A)=0.5, P(B)=0.6, and P(A∩B) =0.8. Find P(A/B) and P(B/A). (CO 1, PO 1)
b.	Derive mean of Uniform distribution. (CO 4, PO 2)
c.	The joint density function of two random variables X and Y is given below. (CO 5, PO 1) $f(X,Y)=\{2-x-y; 0 \leq x \leq 1, 0 \leq y \leq 1, \text{ and } 0, \text{ otherwise,}$ Find conditional density functions.
d.	An urn contains 5 white, 3 red, and 5 black balls. If 2 balls are drawn at random, find the probability that 'two of the balls drawn are black'. (CO 1, PO 2)
e.	In an examination test, 25% of the students have failed in English, 18% in Mathematics, and 10% in both subject. A student is selected at random. What is the probability that the student has failed either in English or in Mathematics? (CO 1, PO 1)
f.	Explain the concept of probability with an example. (CO 3, PO 2)
g.	Normal distribution. (CO 4, PO 1)

Q.3. Structured Question (Attempt any three out of four)

(3 X 10=30)

Question (Attempt any three out of four) (3 X 10=30)									
a.	Let X be a random variable with the following probability distribution: (CO 3, PO 1) <table><tr><td>x</td><td>6</td><td>-6</td><td>-6</td></tr><tr><td>P(x)</td><td>1/6</td><td>1/2</td><td>1/3</td></tr></table> Find E(X), E(X ²), V(X), and E(3X+3) ²	x	6	-6	-6	P(x)	1/6	1/2	1/3
x	6	-6	-6						
P(x)	1/6	1/2	1/3						
b.	The urn I; contains 3 white, 2 black, and 3 red balls, urn II; contains 2 white, 2 black, and 1 red ball, and urn III; contains 4 white, 4 black, and 4 red balls. One urn is chosen at random, and two balls are drawn from it. They happen to be white and red. What is the probability that they come from urns I, II, and III? (CO 2, PO 2)								
c.	Nine coins are thrown simultaneously. Using Binomial distribution, find the probability of getting at least five heads. (CO 5, PO 6)								
d.	Explain Binomial distribution and hence derive its mean and variance. (CO 4, PO 2)								

P.T.O./-

Q.4. Long Answer / Essay type (Attempt any two out of three)

(2 X 15=30)

a.	(i), Two identical boxes contain respectively 4 white and 3 red balls and 3 white and 7 red balls. A box is chosen random, and a ball is drawn from it. If the ball is white, what is the probability that it is from the second box? (CO 5, PO 2) (ii) Explain various kind of continuous random variables. (CO 4, PO 2)																																			
b.	(i), Three coins are tossed. Using Binomial distribution, find the probability that there are two heads. (CO 4, PO 2) (ii) If the probability of horse A winning the race A winning the race is $1/5$ and the probability of horse B wining the same race is $1/6$. What is the probability that one of the horses will win the race? (CO 3, PO 1)																																			
c.	(i), The probability that a student of ABC college passes a Biophysics is $2/3$, and the probability that he passes in both Biophysics and Statistics test is $14/45$. The probability that he passes at least one test is $4/5$. What is the probability that he passes in Statistics test? (CO 2, PO 1) ii) For the adjoining bivariate probability distribution of X and Y, given below: (CO 4, PO 2) <table border="1"> <tr> <th>Y →</th> <th>1</th> <th>2</th> <th>3</th> <th>4</th> <th>5</th> <th>6</th> </tr> <tr> <th>X ↓</th> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>0</td> <td>0</td> <td>0</td> <td>$1/32$</td> <td>$2/32$</td> <td>$2/32$</td> <td>$3/32$</td> </tr> <tr> <td>1</td> <td>$1/16$</td> <td>$1/16$</td> <td>$1/8$</td> <td>$1/8$</td> <td>$1/8$</td> <td>$1/8$</td> </tr> <tr> <td>2</td> <td>$1/32$</td> <td>$1/32$</td> <td>$1/64$</td> <td>$1/64$</td> <td>0</td> <td>$2/64$</td> </tr> </table> Find $P(X < 2, Y \leq 4)$.	Y →	1	2	3	4	5	6	X ↓							0	0	0	$1/32$	$2/32$	$2/32$	$3/32$	1	$1/16$	$1/16$	$1/8$	$1/8$	$1/8$	$1/8$	2	$1/32$	$1/32$	$1/64$	$1/64$	0	$2/64$
Y →	1	2	3	4	5	6																														
X ↓																																				
0	0	0	$1/32$	$2/32$	$2/32$	$3/32$																														
1	$1/16$	$1/16$	$1/8$	$1/8$	$1/8$	$1/8$																														
2	$1/32$	$1/32$	$1/64$	$1/64$	0	$2/64$																														

END SEMESTER EXAMINATION, JUNE- 2025**B. Sc. (Hons.) in Data Science Semester – II****Course Name: Statistics for Data Science****Course Code: BD121T****Time allotted: 03 Hours****Max. Marks: 100****Note: Read all the instructions carefully.****Q.1. Objectives Type****(10 X 2=20)****(Very short/ Short Answer, MCQ, One-liners, Fill in the Blank, True/ False) Attempt all.**

QN	Questions	CO	PO
a.	Ratio scale of measurement	1	2
b.	Give two examples of regression	3	2
c.	Primary data	1	1
d.	Association of attributes	1	2
e.	Qualitative data	5	2
f.	Limitations of statistics	1	1
g.	Principle of least square	5	2
h.	Calculate median: 28, 16, 24, 22, 19, 22	1	1
i.	Demerits of arithmetic mean	4	1
j.	Bowley's coefficient of skewness	2	1

Q.2. Short notes / Short Answer Type (Attempt any five out of Seven)**(5 X 4=20)**

QN	Questions	CO	PO
a.	Measures of Dispersion	1	3
b.	Histogram	2	2
c.	Demerits of arithmetic mean	1	2
d.	Yule's coefficient of association	2	3
e.	Examine the consistency of the following data: N=1000, (A)=600, (B)=500, (AB)=50, the symbols have their usual meaning.	1	3
f.	Properties of regression coefficients	2	4
g.	Sheppard's correction for moments	1	1

P.T.O./-

Q.3. Structured Question (Attempt any three out of four)

(3 X 10=)

Q.3. Structured Question (Attempt any three out of four)

QN	Questions	CO																	
a.	Calculate the 7 th decile and 27 th percentile for the following grouped data. <table><tr><td>C.I.</td><td>110-115</td><td>115-120</td><td>120-125</td><td>125-130</td><td>130-135</td><td>135-140</td><td>140-145</td></tr><tr><td>Frequency</td><td>25</td><td>42</td><td>20</td><td>28</td><td>32</td><td>40</td><td>25</td></tr></table>	C.I.	110-115	115-120	120-125	125-130	130-135	135-140	140-145	Frequency	25	42	20	28	32	40	25	1	
C.I.	110-115	115-120	120-125	125-130	130-135	135-140	140-145												
Frequency	25	42	20	28	32	40	25												
b.	Calculate median for the following datasets. <table><tr><td>C.I.</td><td>20-30</td><td>30-40</td><td>40-50</td><td>50-60</td><td>60-70</td><td>70-80</td><td>80-90</td></tr><tr><td>Frequency</td><td>15</td><td>18</td><td>40</td><td>42</td><td>20</td><td>35</td><td>25</td></tr></table>	C.I.	20-30	30-40	40-50	50-60	60-70	70-80	80-90	Frequency	15	18	40	42	20	35	25	3	1
C.I.	20-30	30-40	40-50	50-60	60-70	70-80	80-90												
Frequency	15	18	40	42	20	35	25												
c.	Explain the significance of the statistical methods in solving real world problems.	5	2																
d.	Explain in detail the different data sources that are usually used by data scientists across world.	5	2																

Q.4. Long Answer / Essay type (Attempt any two out of three)

(2 X 15=30)

Q.4. Long Answer / Essay type (Attempt any two out of three)

QN	Questions	CO	PO																						
a.	Calculate mean, and further calculate standard deviation for the following data. <table><tr><td>Class Interval</td><td>15-25</td><td>25-35</td><td>35-45</td><td>45-55</td><td>55-65</td><td>65-75</td><td>75-85</td></tr><tr><td>Frequency</td><td>10</td><td>15</td><td>24</td><td>34</td><td>25</td><td>28</td><td>32</td></tr></table>	Class Interval	15-25	25-35	35-45	45-55	55-65	65-75	75-85	Frequency	10	15	24	34	25	28	32	1	1						
Class Interval	15-25	25-35	35-45	45-55	55-65	65-75	75-85																		
Frequency	10	15	24	34	25	28	32																		
b.	Define correlation with an example. Find Spearman's rank correlation for the following data, and interpretate the results. <table><tr><td>x</td><td>23</td><td>22</td><td>25</td><td>30</td><td>18</td><td>26</td><td>28</td><td>22</td><td>15</td><td>32</td></tr><tr><td>y</td><td>38</td><td>52</td><td>43</td><td>38</td><td>32</td><td>50</td><td>58</td><td>55</td><td>38</td><td>54</td></tr></table>	x	23	22	25	30	18	26	28	22	15	32	y	38	52	43	38	32	50	58	55	38	54	2	2
x	23	22	25	30	18	26	28	22	15	32															
y	38	52	43	38	32	50	58	55	38	54															
c.	Define principle of least square for the regression line. Calculate regression line y (dependent variable) on x (independent variable) for the following dataset. <table><tr><td>x</td><td>10</td><td>8</td><td>15</td><td>20</td><td>15</td><td>18</td><td>15</td></tr><tr><td>y</td><td>25</td><td>22</td><td>18</td><td>22</td><td>28</td><td>25</td><td>15</td></tr></table>	x	10	8	15	20	15	18	15	y	25	22	18	22	28	25	15	5	2						
x	10	8	15	20	15	18	15																		
y	25	22	18	22	28	25	15																		

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END SEMESTER EXAMINATION, JUNE- 2025**B. Sc. (Hons.) in Data Science Semester – II****Course Name: Discrete Mathematics****Course Code: BDS121****Time allotted: 03 Hours****Max. Marks: 100****Note: Read all the instructions carefully.****Q.1. Objectives Type****(10 X 2=20)****(Very short/ Short Answer, MCQ, One-liners, Fill in the Blank, True/ False) Attempt all.**

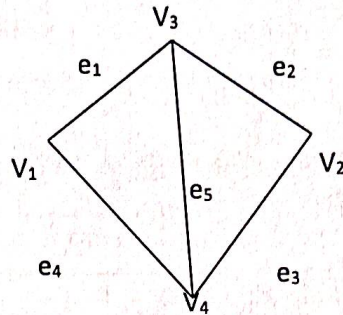
S. No.	Question	CO	PO
a.	If $A = \{a, b, c, d\}$ and $B = \{a, c, e, f, g\}$. Then find $A - B$.	1	1
b.	Write the negation of the statement: "If I play cricket, then I will not go to market today".	3	2
c.	Define an asymmetric relation.	2	1
d.	In an experiment, a person must arrange a square, a cube, a circle, a triangle, and a pentagon in a row. How many different arrangements are possible?	4	2
e.	Define an equivalence relation.	2	1
f.	Define Hamiltonian path.	5	1
g.	In a graph, the sum of degrees of all the vertices is always an odd number.. (True/False)	5	1
h.	Determine the value of $\lfloor -12 \rfloor$ and $\lceil 2.083 \rceil$.	2	1
i.	Determine that how many different words can be formed from the letters of the word "COMPUTER".	4	1
j.	If $A = \{a, b, c, d\}$ and $B = \{a, c, e, f, g\}$. Then determine $A \oplus B$.	1	1

Q.2. Short notes / Short Answer Type (Attempt any five out of Seven)**(5 X 4=20)**

a.	The probability that a new airport will get an award for its design is 0.16, the probability that it will get an award for the efficient use of materials is 0.24, and probability that it will get both awards is 0.11. Find the probability that it will get only one of two awards.	1	2
b.	Apply mathematical induction to show the following for some integer n $1 + 2^n < 3^n$ for $n \geq 2$.	1	2
c.	Let $A = \{2, 3, 4, 5\}$. Consider the relations R and S defined on A as $R = \{(2, 2), (2, 3), (2, 4), (2, 5), (3, 4), (3, 5), (4, 5), (5, 3)\}$ $S = \{(2, 3), (2, 5), (3, 4), (3, 5), (4, 2), (4, 3), (4, 5), (5, 2), (5, 5)\}$. Then compute $S \circ R$ using matrices.	2	1

P.T.O./-

d. Find the incidence matrix of the following graph.



e.	Let $A = B = \{1, 2, 3, 4, 5\}$ and $f = \{(1,1), (2,3), (3,4), (4,2)\}$ be a function from A to B . Determine whether the function is one one and onto.	2	1
f.	Write the converse, inverse and contrapositive of the following statement If I do not study, then I will not go to play.	3	1
g.	Show that if seven integers from 1 to 12 are chosen, then two of them will add up to 13.	4	2

Q.3. Structured Question (Attempt any three out of four)

(3 X 10=30)

a.	(i) Show algebraically that: $A \cap B = B \cap A$ and $A \cup B = B \cup A$. (ii) Define the following: (I) Contingency (II) Contradiction (III) Bi-conditional statement (III) Conditional Statement.	(6) (4)	1 3	2 2
b.	(i) If 60 fans who attended the home formula 1 game bought up all the paraphernalia for the cars. Altogether 20 stickers, 36 car decals and 12 key chains were sold. We know that 52 fans bought at least one items. Also, 6 fans bought both decals and key chains, 9 bought both decals and stickers and 5 bought both key chains and stickers. Find that (I) How many fans bought all the three items. (II) Also find the number of fans who bought exactly one item. (III) Mark all parts of the Venn diagram. (ii) If $p \Rightarrow q$ is false, determine the truth value of $(\sim (p \wedge q)) \Rightarrow q$.	(7) (3)	1 3	2 1
c.	(i) Define the followings in a graph (I) Degree of a vertex (II) pendent edge (III) adjacent vertices (IV) isolated vertex (V) Connected graph. (ii) Determine whether the following graph has a Hamiltonian circuit, a Hamiltonian path but not a Hamiltonian circuit, or neither. Give reasons for your answer	(5) (5)	5	1
d.	(i) Solve the recurrence relation $a_{n+2} - 3a_{n+1} + 2a_n = 12$. (ii) Solve the following recurrence relation $a_{n+3} + a_{n+2} - 8a_{n+1} - 12a_n = 3n^2$.	(3) (7)	4	2

Q.4. Long Answer / Essay type (Attempt any two out of three)

(2 X 15=30)

a.	(i) Check the validity of following argument. (7) If I graduate this semester, then I will have passed the computer course. If I do not study computer for 10 hours a week, then I will not pass computer. If I study computer for 10 hours a week, then I cannot play volleyball $\therefore$ I if I play volleyball, I will not graduate this semester. (ii) Using mathematical induction, show that for every positive integer n, the expression $11^n - 2^n$ is divisible by 9 (8)	3	2
b.	(i) Define Tautology, contradiction and contingency. (3) (ii) Determine whether the following statement is a tautology, contingency or a contradiction $(\sim q) \wedge (p \Rightarrow q) \Rightarrow \sim p.$ (4) (iii) Let $A = R \times R$ (R is the set of reals). Define the relation S on A as $(a, b) S (c, d)$ if and only if $a^2 + b^2 = c^2 + d^2$. Check whether S is an equivalence relation on A. (8)	3	2
c.	(i) A panel has to select a president, vice president and secretary from the committee of five members namely Ankit, Arjit, Sonu, Monu and Nonu. (8) (I) In how many selections include Sonu and Monu, (II) How many selections are there in which either Nonu is a secretary or he is excluded, (III) How many selections are there in which Ankit is president. (ii) If Q is the set of rational numbers, then show that the function $f : Q \rightarrow Q$ defined by $f(x) = -3x + 6, x \in Q$, is bijective function. Also, find a formula that defines the inverse function f^{-1}. (7)	4	2

END SEMESTER EXAMINATION, JUNE- 2025

B. Sc. (Hons.) in Data Science Semester - II

Course Name: Data Structures using C

Course Code: BD123T

Time allotted: 03 Hours

Max. Marks: 100

Note: Read all the instructions carefully.

Q.1. Objective Type

(Very short/ short Answer, MCQ, One-liners, Fill in the blanks, True/ False) Attempt all. (10×2=20)

Q.N.	Questions	CO	PO
a.	Define string.	1	1
b.	Define an algorithm.	2	1
c.	Write the total number of keywords used in C language.	1	1
d.	Following sequential operations are performed on stack: push (1), push (2), pop, push (1), push (2), pop, pop, pop, push (2), pop. Determine the sequences of popped out values.	3	2
e.	Write an algorithm to check the entered year is leap year or not.	1	1
f.	Explain linear search with a suitable example.	5	1
g.	Distinguish between local and global variables.	1	1
h.	The policy of queue is _____.	3	1
i.	A node in graph, with zero degree, is called _____.	4	1
j.	Differentiate between malloc () and calloc () memory allocation functions.	2	2

Q.2. Short notes / Short Answer Type (Attempt any five out of Seven)

(5×4=20)

QN	Questions	CO	PO
a.	Sort the following elements using merge sort- 44, 33, 11, 55, 77, 90, 40, 60, 99, 22, 88, 66. Also show all intermediate steps.	5	2
b.	Explain doubly linked list with a suitable diagram	3	1
c.	Sort the following elements using selection sort A = (9, 1, 7, 5, 6, 4, 2, 10, 8).	5	2
d.	Distinguish between array and structure with a suitable example.	2	1
e.	Explain hash collision resolution techniques.	5	1
f.	Consider the following infix expression Q: $((A + B) * D) \uparrow (E - F)$ Using stack to translate Q into its equivalent postfix expression P.	3	2
g.	Compare DFS vs. BFS.	4	1

P.T.O./-

Q.3. Structured Question (Attempt any three out of four)

(3×10)

QN	Questions	CO	PO
a.	Show the steps of quick sort on the following set of elements: 25, 57, 48, 37, 12, 92, 86, 33. Assume the first element of the list to be the pivot element.	5	2
b.	Define sparse matrix. Describe a data structure for the efficient storage of a sparse matrix.	2	1
c.	Define graph traversal. Write an algorithm for graph traversal.	4	1
d.	Describe hashing. Give an explanation of the various hash index or address calculation techniques.	5	2

Q.4. Long Answer / Essay type (Attempt any two out of three)

(2×15=30)

QN	Questions	CO	PO
a.	(i) Discuss the array representation of stack. (ii) Write the algorithms for push and pop stack operations.	3	1
b.	(i) Define a binary tree. (ii) Explain tree traversals. Write a tree traversal algorithm.	4	2
c.	Consider the following queue of characters where QUEUE is a circular array which is allocated six memory cells: FRONT = 2, REAR = 4, QUEUE: __, A, C, D, __, __ ("__" denoted empty memory cell). Describe the queue as the following operations takes place: (i) F is added to the queue. (ii) Two letters are deleted. (iii) K, L, and M are added to queue (iv) Two letters are deleted. (v) R is added to queue. (vi) Two letters are deleted. (vii) S is added to queue. (viii) Two letters are deleted.	3	2

END SEMESTER EXAMINATION, JUNE- 2025**B. Sc. (Hons.) in Data Science Semester - II****Course Name: Introduction to Data Warehousing and Mining****Course Code: BD124T****Time allotted: 03 Hours****Max. Marks: 100****Note: Read all the instructions carefully.****Q.1. Objective Type****(Very short/ short Answer, MCQ, One-liners, Fill in the blanks, True/ False) Attempt all. (10×2=20)**

QN	Questions	CO	PO
a.	Mention any two characteristics of a Data Warehouse.	1	1
b.	What is ETL?	1	1
c.	Define dimensionality reduction.	2	1
d.	What is feature subset selection?	2	1
e.	Define confidence.	3	1
f.	What is the APRIORI principle?	3	1
g.	What is KNN?	4	1
h.	What is meant by overfitting?	4	1
i.	Define Partitioning clustering.	5	1
j.	What is PAM?	5	1

Q.2. Short notes / Short Answer Type (Attempt any five out of Seven)**5×4=20**

QN	Questions	CO	PO
a.	Given two cluster centers: C1(2, 3) and C2(5, 7), and a data point P(4, 6). Determine to which cluster (C1 or C2) point P belongs using Euclidean distance.	5	1,4
b.	Describe the characteristics of Fact and Dimension tables.	1	1,2
c.	Write a note on data cleaning techniques.	2	1,4
d.	Write a note on star schema with a neat diagram	1	1,2
e.	A dataset has: P(Class = Positive) = 0.6 P(Class = Negative) = 0.4 P(Feature1 = Yes Positive) = 0.7 P(Feature1 = Yes Negative) = 0.3 A new instance has Feature1 = Yes . Use Naïve Bayes to classify this instance.	4	4,8
f.	Define frequent item set generation with an example.	3	2,4
g.	Write a note on the FP-Growth algorithm.	3	1,4

P.T.O./-

Q.3. Structured Question (Attempt any three out of four)

(3×10=30)

QN	Questions	CO	PO
a.	Explain the APRIORI algorithm in detail with step-by-step working.	3	1,4
b.	Elaborate on clustering techniques with examples.	5	1,2
c.	Discuss different approaches to solve a classification problem.	4	1,4
d.	Describe OLAP server architectures - ROLAP, MOLAP, and HOLAP.	1	2

Q.4. Long Answer / Essay type (Attempt any two out of three)

(2×15=30)

QN	Questions	CO	PO																												
a.	Describe Data Modeling and its importance in Data Warehousing with types of data models.	1	1,4																												
b.	<table border="1"> <thead> <tr> <th>ID</th><th>Weather</th><th>Temperature</th><th>Play</th></tr> </thead> <tbody> <tr> <td>1</td><td>Sunny</td><td>Hot</td><td>No</td></tr> <tr> <td>2</td><td>Sunny</td><td>Mild</td><td>No</td></tr> <tr> <td>3</td><td>Overcast</td><td>Hot</td><td>Yes</td></tr> <tr> <td>4</td><td>Rain</td><td>Mild</td><td>Yes</td></tr> <tr> <td>5</td><td>Rain</td><td>Cool</td><td>Yes</td></tr> <tr> <td>6</td><td>Overcast</td><td>Cool</td><td>Yes</td></tr> </tbody> </table> 1. Calculate the entropy of the entire dataset. 2. Calculate Information Gain for 'Weather' and 'Temperature'. 3. Select the best attribute for the root node.	ID	Weather	Temperature	Play	1	Sunny	Hot	No	2	Sunny	Mild	No	3	Overcast	Hot	Yes	4	Rain	Mild	Yes	5	Rain	Cool	Yes	6	Overcast	Cool	Yes	4	1,2
ID	Weather	Temperature	Play																												
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3	Overcast	Hot	Yes																												
4	Rain	Mild	Yes																												
5	Rain	Cool	Yes																												
6	Overcast	Cool	Yes																												
c.	Explain data preprocessing techniques in detail with examples.	2	2,4																												
