

MASTER OF SCIENCE DATA SCIENCE AND ANALYTICS (MSCDSA)

MSCDSA/ASSIGN/SEMESTER-II

ASSIGNMENTS

(July – 2026 & January – 2027)

**MCS-066, MCS-067, MCS-224, MCS-068, MCSL-069,
MCSL-070**



**SCHOOL OF COMPUTER AND INFORMATION SCIENCES
INDIRA GANDHI NATIONAL OPEN UNIVERSITY
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Important Notes

1. Submit your assignments to the Coordinator of your Study Centre on or before the due date.
2. Assignment submission before due dates is compulsory to become eligible for appearing in corresponding Term End Examinations. For further details, please refer to MSCDSA Programme Guide.
3. To become eligible for appearing the Term End Practical Examination for the lab courses, it is essential to fulfill the minimum attendance requirements as well as submission of assignments (on or before the due date). For further details, please refer to the MSCDSA Programme Guide.
4. The viva voce is compulsory for the assignments. For any course, if a student submitted the assignment and not attended the viva-voce, then the assignment is treated as not successfully completed and would be marked as ZERO.

Course Code : MCS-224
Course Title : Artificial Intelligence & Machine Learning
Assignment Number : MSCDSA (II)/224/Assign/2026-27
Maximum Marks : 100
Weightage : 30%
Last Date of Submission : 31st October, 2026 (for July session)
 30th April, 2027 (for January session)

This assignment has sixteen questions with a total marks 80, answer all questions. The remaining 20 marks are for viva voce. You may use illustrations and diagrams to enhance the explanations. Please go through the guidelines regarding assignments given in the Programme Guide for the format of presentation.

Q1: What is learning? Define the following ways of learning: (5 Marks)
 (I) Rote Learning (II) Learning by Instruction (III) Learning by analogy (IV) Learning by Induction (V) Learning by deduction

Q2: Define is Artificial Intelligence? What are the applications of AI in the healthcare and agricultural domains? (4 Marks)

Q3: Find the minimum cost path for the 8-puzzle problem, where the start and goal state are given as follows: (4 Marks)

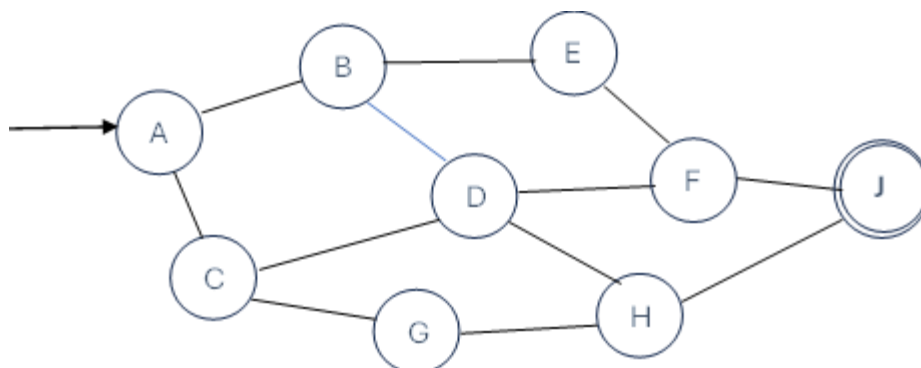
1	2	3
4	8	-
7	6	5

Start State

1	2	3
4	5	6
-	7	8

Goal State

Q4: Apply BFS algorithm on the following graph. (5 Marks)



Q5: Draw a semantic network for the following English statement: (4 Marks)
 "Shyam owns a dog named Sheru, and Sheru likes to chase cats".

Q6: In a class, three students tossed one coin (one each) 3 times. Answer the following. (4 Marks)

- (a) Write down all the possible outcomes which can be obtained in this experiment.
 (b) What is the probability of getting 2 or more than 2 heads at a time? Also, write the probability of getting three tails at a time.
 (c) Calculate the Relative frequency of tail $r_n(T)$.

Q7: Explain Dempster-Shafer theory with a suitable example. **(4 Marks)**

Q8: For the following fuzzy sets: **(5 Marks)**

$$A = \{ a/0.6, b/0.4, c/0.5, d/0.0, e/0.8 \}; B = \{ a/0.2, b/0.8, c/0.7, d/0.3, e/0.5 \}$$

$$C = \{ a/0.1, b/0.2, c/0.8, d/0.6, e/0.2 \}$$

Find the fuzzy sets: (i) $A \cup B \cup C$ (ii) $A \cap B \cap C$ (iii) $A' \cup B' \cup C'$ (iv) $A' \cap B' \cap C'$ (v) $(A \cap B \cup C)'$

Q9: What is ensemble learning? Explain three primary classes of ensemble learning methods. **(4 Marks)**

Q10: Use Naive Bayes classification method for the following dataset and classify the class (Species) of $X = \{ \text{Color=Green, Legs=2, Height=Tall, Smelly=No} \}$ **(7 Marks)**

Sl. No.	Color	Legs	Height	Smelly	Species
1	White	3	Short	Yes	M
2	Green	2	Tall	No	M
3	Green	3	Short	Yes	M
4	White	3	Short	Yes	M
5	Green	2	Short	No	H
6	White	2	Tall	No	H
7	White	2	Tall	No	H
8	White	2	Short	Yes	H

Q11: What is a Decision Tree? Use ID3 algorithm to create the decision tree for the following dataset and use it to find the class of unknown sample $X = \{ \text{Peter, red, short, average} \}$ **(7 Marks)**

Independent Attributes / Condition Attributes					Dependent Attributes / Decision Attributes
Name	Hair	Height	Weight	Lotion	Result
Sarah	blonde	average	light	no	sunburned (positive)
Dana	blonde	tall	average	yes	none (negative)
Alex	brown	short	average	yes	none

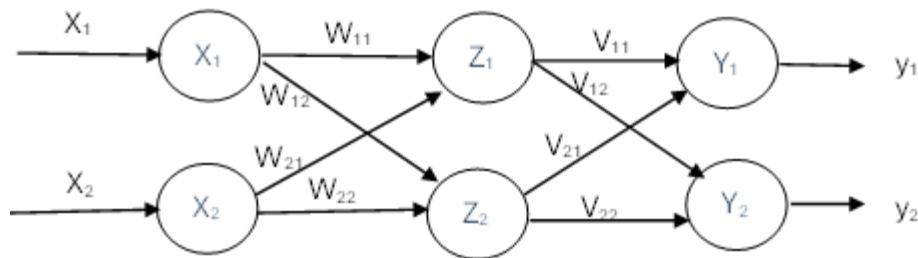
Annie	blonde	short	average	no	sunburned
Emily	red	average	heavy	no	sunburned
Pete	brown	tall	heavy	no	none
John	brown	average	heavy	no	none
Katie	blonde	short	light	yes	none

Q12: Find a quadratic regression model for the following data. Use the regression model and calculate the value of Y at X = 9. **(5 Marks)**

X	3	4	5	6	7
Y	2.5	3.2	3.8	6.5	11.5

Q13: For the given points of two classes Blue and Yellow: **(6 Marks)**
Blue: { (1,2), (2,3), (-1,2), (-1,4), (-1,-1) }
Yellow: { (4,2), (5,-1), (5,1), (6,1), (5,3) }
Plot a graph for the Blue and Yellow categories. Find the support vectors and optimal separating line.

Q14: The following diagram represents a feed-forward neural network with one hidden layer: **(6 Marks)**



For the following input patterns, calculate the output of the network (y_1 and y_2) if weights are initialized as: $W_{11} = -1$, $W_{12} = 2$, $W_{21} = 1$, $W_{22} = -2$, $V_{11} = 2$, $V_{12} = -1$, $V_{21} = -2$, $V_{22} = 2$. Use activation function $F(Y) = 1$ for $Y \geq 0$ and $F(Y) = 0$ otherwise.

Pattern	P ₁	P ₂	P ₃	P ₄
X ₁	0	1	0	1
X ₂	0	0	1	1

Q15: Consider the following two-dimensional pattern. Using PCA algorithm, calculate the principal component. **(5 Marks)**

X _i	2	4	5	6	6	7	9	8
Y _i	1	6	4	5	7	7	10	9

Q16: Explain Apriori algorithm with the help of a suitable example. **(5 Marks)**