USN | | | | | | | | | |

18CS71

Seventh Semester B.E. Degree Examination, June/July 2023
Artificial Intelligence and Machine Learning

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1   a. What is Artificial Intelligence? List the applications. **(05 Marks)**
    b. Solve the 4-gallon water jug problem, writing appropriate production rules. **(07 Marks)**
    c. Apply A* algorithm and find the most cost effective path from start state A to final state J.
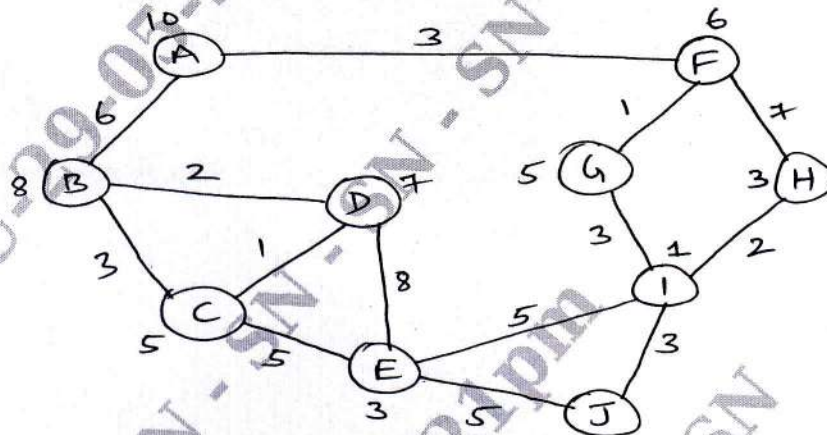

Fig. Q1 (c) **(08 Marks)**

OR

2   a. What is Heuristic search? Explain the characteristics of heuristic search. **(07 Marks)**
    b. Provide the solution for water Jug problem by stating the general rules. **(07 Marks)**
    c. Write the Hill climbing search algorithm of AI. **(06 Marks)**

Module-2

3   a. Discuss the framework of knowledge representation along with any two knowledge representation scheme. **(10 Marks)**
    b. Explain in brief forward reasoning and backward reasoning. **(10 Marks)**

OR

4   a. Define concept learning. Explain the task of concept learning. **(05 Marks)**
    b. Write Find-S algorithm. **(05 Marks)**
    c. Write candidate elimination algorithm. Apply the algorithm for the below dataset to obtain the final version space.

Ex	Citations	Size	Inlibrary	Price	Editions	Buy
1	Some	Small	No	Affordable	One	No
2	Many	Big	No	Expensive	Many	Yes
3	Many	Medium	No	Expensive	Few	Yes
4	Many	Small	No	Affordable	Many	Yes

(10 Marks)

Module-3

5 a. Explain the concepts of entropy and information gain in decision tree. **(05 Marks)**

b. Apply ID3 algorithm for constructing decision tree for the following training examples. **(10 Marks)**

Instances	a_1	a_2	a_3	Classification
1	True	Hot	High	No
2	True	Hot	High	No
3	False	Hot	High	Yes
4	False	Cool	Normal	Yes
5	False	Cool	Normal	Yes
6	True	Cool	High	No
7	True	Hot	High	No
8	True	Hot	Normal	Yes
9	False	Cool	Normal	Yes
10	False	Cool	High	Yes

c. List and explain the appropriate problems for decision tree learning. **(05 Marks)**

OR

6 a. Apply perceptron rule for implement XOR gate by considering the following and compute the final weights.

Inputs : X_1, X_2

Output : y

Initial weights : W11 = W21 = 1

W12 = W22 = 1

V1 = V2 = 1

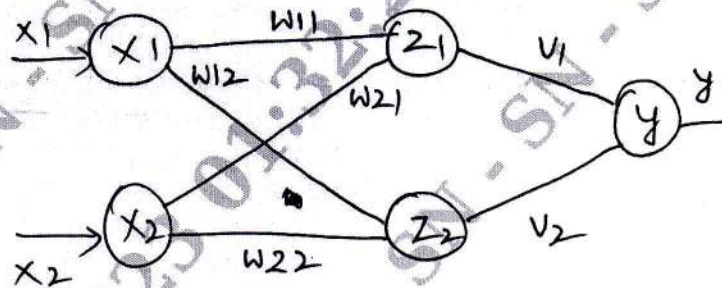Threshold = 1 and learning rate = 1.5

Fig. Q6 (a) **(06 Marks)**

b. Write Back propagation algorithm. **(07 Marks)**

c. Discuss the perceptron training rule and delta rule that solves the learning problem of perceptron. **(07 Marks)**

Module-4

7 a. Explain Bayes theorem and MAP hypothesis with equations. **(06 Marks)**

b. Outline Brute force MAP learning algorithm. **(08 Marks)**

c. In Orange country, 51% of the adults are males (other 49% are ofcourse females). One adult is randomly selected for a survey involving credit card usage.

(i) Find the prior probability that the selected person is male.

(ii) It is later learned that the selected survey subject was Smoking a Cigar. Also, 9.5% of males smoke Cigar, whereas 1.7% of females smoke Cigars. Use this additional information to find the probability that the selected subject is a male. **(06 Marks)**

OR

8 a. Discuss the minimum description length algorithm. **(07 Marks)**

b. Apply Naïve Bayes classifier for the below dataset to classify the new instances. (Color = Green, Legs = 2, Height = Tall and Smelly = No)

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

(07 Marks)

c. Explain Gibbs algorithm. **(06 Marks)**

Module-5

9 a. Discuss K-Nearest Neighbor learning algorithm. **(08 Marks)**
b. Discuss in brief locally weighted linear regression. **(06 Marks)**
c. Explain in brief case based reasoning. **(06 Marks)**

OR

10 a. Explain in brief the reinforcement learning technique. **(10 Marks)**
b. Discuss the learning tasks and Q learning in the context of reinforcement learning. **(10 Marks)**

* * * * *