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

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. (08 Marks)

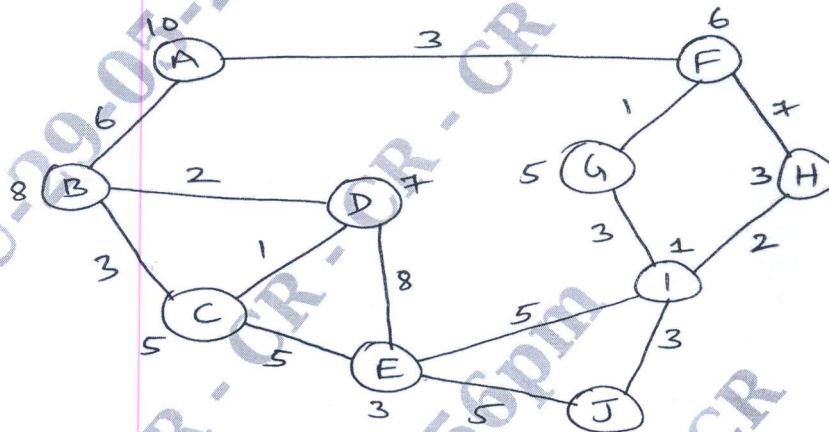


Fig. Q1 (c)

(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. (10 Marks)

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)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.  
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

**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 <sub>1</sub>	a <sub>2</sub>	a <sub>3</sub>	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 :  $W_{11} = W_{21} = 1$  $W_{12} = W_{22} = 1$  $V_1 = V_2 = 1$ 

Threshold = 1 and learning rate = 1.5

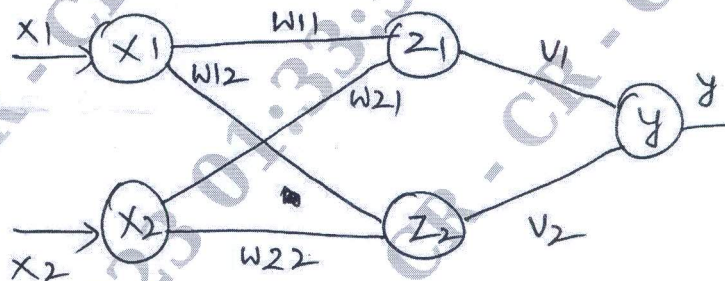


Fig. Q6 (a)

- b. Write Back propagation algorithm. (06 Marks)  
 c. Discuss the perceptron training rule and delta rule that solves the learning problem of perceptron. (07 Marks)

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- 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. (06 Marks)  
 (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

- 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)

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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)

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