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RV COLLEGE OF ENGINEERING®

(An Autonomous Institution Affiliated to VTU)

V Semester B. E. Regular Examinations Feb/Mar-2025

Common to ISE/CSE/CD/CY

ARTIFICIAL INTELLIGENCE & MACHINE LEARNING

Maximum Marks: 100

Time: 03 Hours

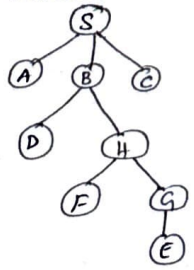
Instructions to candidates:

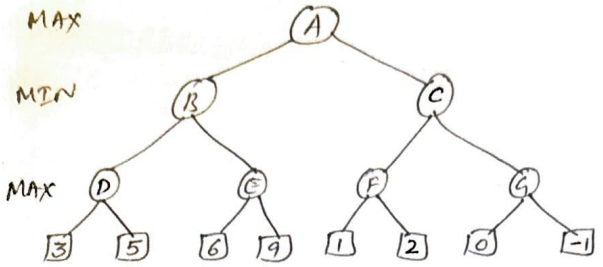
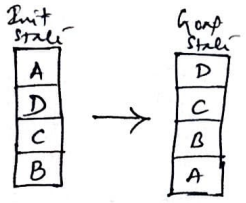
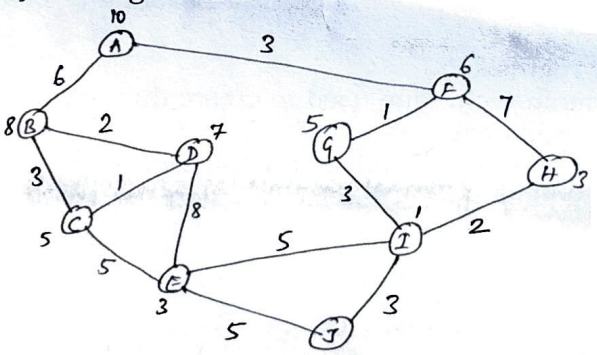
1. Answer all questions from Part A. Part A questions should be answered in first three pages of the answer book only.
2. Answer FIVE full questions from Part B. In Part B question number 2 is compulsory. Answer any one full question from 3 and 4, 5 and 6, 7 and 8, 9 and 10.

PART-A

			M	BT	CO
1	1.1	What is meant by an agent program?	01	1	1
	1.2	A _____ function assigns a numeric cost to each path.	01	1	1
	1.3	Distinguish between a rational agent and a non-rational agent.	02	2	1
	1.4	"Could an agent learn how to search better?" Discuss.	02	2	2
	1.5	An adversial search problems are often known as _____.	01	1	1
	1.6	List any two variants of hill climbing.	01	1	1
	1.7	In a two-player game, how does the minimax algorithm ensure that both players play optimally?	02	2	2
	1.8	List any four key characteristics of Nearest Neighbor classifiers.	02	1	1
	1.9	For a continuous random variable, the probability of taking a specific value of x is _____.	01	1	1
	1.10	Define logistic regression.	01	1	2
	1.11	Illustrate the main technique used to create diversity among the trees in a random forest.	01	2	1
	1.12	In a decision tree, the Gini index of a split is 0.5 and in another split, it is 0.3. Which split is considered better for classification? Give reason.	02	3	1
	1.13	"K" in k-means represent _____.	01	1	2
	1.14	Define cluster analysis.	01	1	1
	1.15	Identify the key challenges in evaluating clustering results.	01	2	1

PART-B

2	a	Describe *AI* problems and its components. Explain how a problem solving agent works? Summarize real-world *AI* problems with examples.	08	2	2
	b	Solve the graph shown in Fig 2b using Breadth-First Search and Depth- First Search algorithms. Explain every step with details. Also compare the results.  Fig 2b	08	3	2

3	a	Compare and contrast A^* search with Greedy Best First search. Use suitable examples to illustrate their differences.	10	3	2
	b	Implement Alpha-Beta pruning for the graph shown in Fig 3b.  Fig 3b	06	3	3
		OR			
4	a	Explain hill climbing algorithm by solving the following problem. Draw the complete search tree with the local and global heuristic values. 			
	b	Define Informed Search. Explain A^* search algorithm in detail and apply for the graph shown in Fig 4b where A is the initial node is and J is the goal node.  Fig 4b	08	2	3
			08	3	3
5	a	List and explain the common reasons for model overfitting.	06	2	2
	b	Construct a decision tree for the dataset given using ID3 algorithm.			

Outlook	*Temperature*	*Humidity*	*Wind*	*Play tennis*
Sunny	*Hot*	*High*	*Weak*	*No*
Sunny	*Hot*	*High*	*Strong*	*No*
Overcast	*Hot*	*High*	*Weak*	*Yes*
Rainy	*Mild*	*High*	*Weak*	*Yes*
Rainy	*Cool*	*Normal*	*Weak*	*Yes*
Rainy	*Cool*	*Normal*	*Strong*	*No*
Overcast	*Cool*	*Normal*	*Strong*	*Yes*
Sunny	*Mild*	*High*	*Weak*	*No*
Sunny	*Cool*	*Normal*	*Weak*	*Yes*
Rainy	*Mild*	*Normal*	*Weak*	*Yes*

			10	3	3
		OR			

6	a	Summarize the general framework for classification in Machine Learning.	08	2	1
	b	Explain the following in model selection: i) Incorporating model complexity ii) Estimating statistical bounds	08	2	1
7	a	Describe the following concepts with suitable examples. i) Random forests ii) Boosting iii) Bagging iv) Voting classifiers.	10	2	1
	b	Discuss the K-Nearest Neighbour algorithm with an example.	06	3	3
		OR			
8	a	Describe Naïve-Bayes classifier in detail.	08	2	3
	b	Compare and contrast logistic regression with decision trees and support vector machines in terms of interpretability, training time and performance on linearly separable data.	08	2	3
9	a	Briefly describe the following clustering approaches with suitable examples: i) Hierarchical clustering ii) Partitioning clustering iii) Density-based clustering iv) Grid-based clustering.	10	3	2
	b	Explain the following: i) Assessing the significance of cluster validity measures ii) Choosing a cluster validity measure.	06	2	1
		OR			
10	a	Explain the strength and weakness of k-means clustering. Provide suggestion for improving the algorithm's robustness in real-world applications.	08	2	1
	b	Illustrate the Unsupervised cluster evaluation mechanism using i) Cohesion and Separation ii) The Proximity matrix.	08	2	2