

Name:	 UPES UNIVERSITY WITH A PURPOSE
Enrolment No:	

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, December 2019

Course: Artificial Intelligence and Machine Learning	Semester: V
Program: B. Tech.	Time 03 hrs.
Course Code: ECEG3201	Max. Marks: 100

Instructions: Attempt all the questions

SECTION A

S. No.		Marks	CO
Q 1	Answer the following objective questions: (a) What is state space? (i) The whole problem (ii) Definition to a problem (iii) Problem you design (iv) Representing your problem with variable and parameter (b) What is called as exploration problem? (i) State and actions are unknown to the agent (ii) State and actions are known to the agent (iii) Only actions are known to agent (ii) None of the mentioned (c) Depth-first search always expands the _____ node in the current fringe of the search tree. (i) Shallowest (ii) Child node (iii) Deepest (iv) Minimum cost (d) Best-First search is a type of informed search, which uses _____ to choose the best next node for expansion. (i) Evaluation function returning lowest evaluation (ii) Evaluation function returning highest evaluation (iii) Evaluation function returning lowest & highest evaluation (iv) None of these	4	CO1
Q 2	Elucidate rule-based reasoning. Differentiate forward reasoning and backward reasoning.	4	CO2
Q 3	What are the main reasons of popularity of metaheuristic algorithms? Briefly classify the metaheuristic algorithm.	4	CO4
Q 4	Elucidate mean-end analysis with a suitable example.	4	CO1
Q 5	What is knowledge based learning? Describe explanation-based generalization. What is the role of the data in driving explanation-based generalization?	4	CO3

SECTION B

Q 6	A glass factory that specializes in crystal is developing a substantial backlog and for this the firm's management is considering three courses of action. The correct choice depends large upon the future demand, which may be low, medium and high. Show	10	CO2
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the decision situation in the form of a decision tree and indicate the most preferred

Demand	Probability	Course of Action		
		Sub-Contracting	Overtime	Increase employee
Low	0.10	10	-20	-150
Medium	0.50	50	60	20
High	0.40	50	100	200

decision and its corresponding expected value.

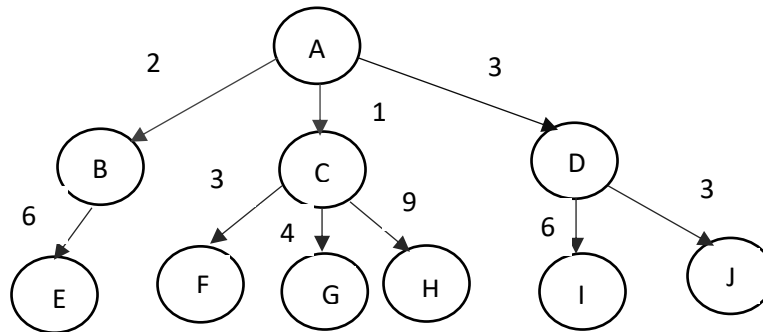
Q 7 What is meant by swarm intelligence? Illustrate the mathematical model and pseudo code of Whale optimization algorithm.

10 CO4

Q 8 Explain the following with respect to unsupervised learning:
(a) k-Means Clustering (b) Hierarchical Clustering

10 CO3

Q 9 Consider the tree shown in figure 1. The numbers on the arcs are the arc length; the heuristic estimates of B = 2, C = 6 and D = 3; all other states have a heuristic estimate of 0.

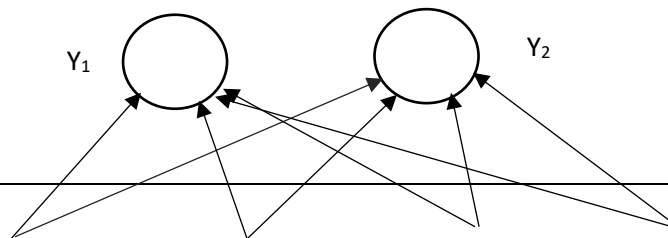


10 CO1

Assume that the children of a node are expanded in alphabetical order when no other order is specified by the search and that the goal is state J. No visited or expanded lists are used. In what order would the states be expanded by each type of search (DFS, BFS, best-first search and A*). Write only the sequence of states expanded by each search.

SECTION-C

Q 10 Design an self organizing map to cluster four given vectors [1, 1, 0, 1], [0, 0, 1, 1], [1, 0, 1, 0] and [1, 0, 1, 1]. Number of clusters to be formed is 2. Assume an initial learning rate of 0.5. Initial weight vector is [0.3, 0.5, 0.7, 0.2; 0.6, 0.5, 0.4, 0.1]



20 CO3

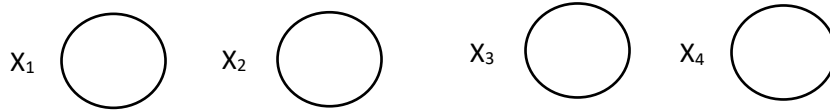


Figure 2

Q 11	<p>Tic-tac-toe is a game for two players. The board is a square of 3 X 3 fields. Each player is assigned a type of token (O or X). Initially the board is empty. The players play in turn and place a token on an empty field. A player wins if she/ he has first aligned three of her/his tokens either in a row, a column or one of the two diagonals. The game ends when a player wins or when there are no more empty fields.</p> <p>(i) Design the search tree for tic-tac-toe up to level 2. Take into account symmetric game states, i.e. those states that can be transformed into each other by rotation and mirroring.</p> <p>(ii) Give an estimation on the number of possible different tic-tac-toe games.</p> <p>(iii) Develop an evaluation function for the tic-tac-toe game.</p> <p>(iv) Indicate the value of your evaluation function for each node of the search tree at level 2. Use these values to compute the values of the nodes on level 1 and 0 using the MINMAX algorithm.</p> <p>(v) Indicate all the nodes in the search tree that would not have been considered when using alpha-beta pruning.</p>	20	CO1
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