UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, December 2020

Programme Name: M. Tech.   Semester   : I
Course Name   : Artificial Intelligence and Neural Network   Time   : 03 Hrs
Course Code   : CSAI 7001   Max. Marks: 100
Nos. of page(s)   : 03
Instructions: Attempt all the questions

	SECTION A		(5 X 6 = 30 Marks)

S. No.		Marks	CO
Q 1	(a) Which is the first AI programming language? (i) BASIC (ii) FORTRAN (iii) JAVA (iv) LISP (b) Breadth-first search technique is optimal in which scenario? (i) When there is less number of nodes (ii) When all step costs are equal (iii) When all step costs are unequal (iv) None of the mentioned (c) The term _____ is used for a depth-first search that chooses values for one variable at a time and returns when a variable has no legal values left to assign. (i) Forward search (ii) Backtrack search (iii) Hill algorithm (iv) Reverse-Down-Hill search (d) Convert into FOL form: **UPES is an academic institution** (i) academic institution(UPES) (ii) UPES(academic institution) (iii) UPES→ academic institution (iv) None of these (e) Which of the following primitive defines the statement "Transfer physical location of an object". (i) ATRANS (ii) MTRANS (iii) PTRANS (iv) MBUILD	5 M	CO1

Q 2	(a) SVM is an example of? (i) Linear Classifier and Maximum Margin Classifier (ii) Non-Linear Classifier and Maximum Margin Classifier (iii) Linear Classifier and Minimum Margin Classifier (iv) Non-linear Classifier and Minimum Margin Classifier (b) Which of the following will be the Euclidean distance between the two data points A (4, 3) and B (2, 3)? (i) 1 (ii) 2 (iii) 4 (iv) 8 (c) Which of the following is an example of the ensemble learning algorithm? (i) Random Forest (ii) Decision Trees (iii) kNN (iv) SVM (d) Which of the following is the machine learning library in python programming language? (i) Pandas (ii) Numpy (iii) Scikit-learn (iv) Matplotlib (e) Which of the following is coefficient of determination in regression problem? (i) SSR (Sum of Squares due to Regression) (ii) SSE (Sum of Squares due to Error) (iii) SST (Sum of Squares Total) (iv) R-square (R2)	5 M	CO3
Q 3	Differentiate multi-layer neural network and radial basis function neural network.	5 M	CO2
Q 4	(a) Differentiate the following: (i) Depth first search and Breadth first search algorithm (ii) A* and AO* algorithm	5 M	CO1
Q 5	Briefly explain logistic regression with a suitable example.	5 M	CO3
Q 6	What do you understand by the term metaheuristic? Why metaheuristic algorithms are widely used for solving optimization problems? Differentiate exploration and exploitation search phenomenon in optimization algorithm.	5 M	CO4
SECTION B		**(10 X 5 = 50 Marks)**	
Q 7	What do you understand by production system and state space search? Explain the following heuristic search techniques with suitable example: (i) Generate and Test (ii) Hill Climbing (iii) Best First Search (iv) Mean End Analysis Algorithm	10 M	CO1

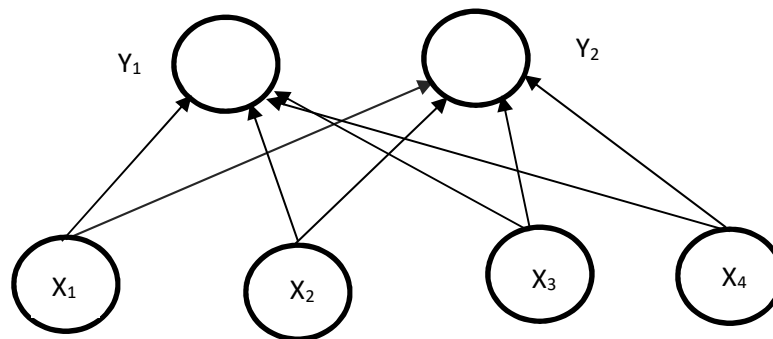| Q 8	Explain the concept of resolution in predicate logic. Consider the following facts: (a) John likes all kinds of pets. (b) Dogs are pets. (c) Cats are pets. (d) Any animal anyone owns and is not killed is a pet. (e) Reji owns a goat and is still alive. (f) Vinod owns everything Reji owns. (i) Translate the facts into formulae in predicate logic. (ii) Convert the formulae into clausal form. (iii) Prove that Jack likes goats using resolution	10 M	CO1
Q 9	What is a perceptron? Derive the expression of weight change in a multi-layer neural network using back-propagation algorithm.	10 M	CO2
Q 10	What is classification in a supervised learning algorithm? Briefly explain the classification learning steps with a flow chart. Discuss the kNN and SVM classification model with its strength, weakness and applications.	10 M	CO3
Q 11	What is swarm intelligence? Illustrate the pseudo code and mathematical model of whale optimization algorithm. Briefly explain the convergence phenomenon of optimization algorithm.	10 M	CO4
SECTION C		**(20X1 = 20 Marks)**	
Q 12	(a) How unsupervised learning is different from supervised learning? Explain with a suitable example. What is clustering in unsupervised learning? Briefly explain any two clustering techniques. (b) Design a self-organizing map to cluster four given vectors [1, 1, 0, 0], [0, 0, 0, 1], [1, 0, 0, 0] and [0, 0, 1, 1]. Number of clusters to be formed is 2. Assume an initial learning rate of 0.5. Initial weight vector is [0.2, 0.4, 0.6, 0.8; 0.9, 0.7, 0.5, 0.3]. **Figure 1**	20 M	CO3