Reg.No.							

Bansilal Ramnath Agarwal Charitable Trust's
VISHWAKARMA INSTITUTE OF TECHNOLOGY, PUNE – 411037.
(An Autonomous Institute Affiliated to Savitribai Phule Pune University)

Examination: ESE

Year: 2023-24 Second Year **Branch:** AIML

Subject: Mathematics for AI **Subject Code:** CS2249

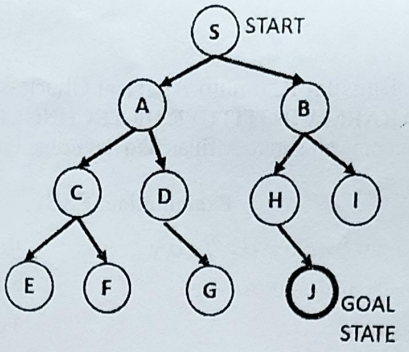
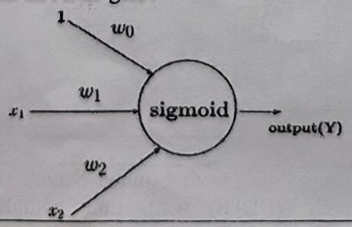
Max. Marks: 100 **Total Pages of Question Paper:** 3

Day & Date: Friday, 24/11/23 **Time:** 10.30am-1.30pm

Instructions to Candidate

1. All questions are compulsory.
2. Neat diagrams must be drawn wherever necessary.
3. Figures to the right indicate full marks.

Q. N.	CO No.	BT* No.	Question	Max marks
Q. 1. a)	CO1	3	Translate the following English sentences into the logical expressions. 1) "You can access the GPU from NVIDIA Lab in the campus only if you are a student of Artificial Intelligence or you are not a freshman." 2) "Colored flowers are always scented." 3) "Anyone who eats some pizza is not a nutrition fanatic." 4) "Anyone who buys any watermelon either carves it or eats it.	8 marks
Q. 1. b)	CO1	3	Prove the following statement using Forward Chaining: Prove that: "John is criminal." Given: "As per the law, it is a crime for a British to sell weapons to hostile nations. Country X, an enemy of UK, has some missiles, and all the missiles were sold to it by John, who is a British citizen."	8 marks
Q. 2.a)	CO2	4	Compare Non-monotonic and monotonic reasoning.	8 marks
Q. 2.b)	CO2	2	Explain default reasoning with suitable examples.	8 marks
Q. 3.	CO3	5	Solve the given 8-puzzle problem using Breadth First Search (BFS) and using Hill Climbing Heuristics search. Draw the problem state space tree. Evaluate both the state trees w.r.t. number nodes processed. **Initial State:** 2 8 3 1 6 4 7 5 **Goal State:** 2 3 1 8 4 7 6 5	18 marks
			OR	
Q. 3.	CO3	5	Evaluate the Depth Limited Search (DLS) and Iterative Deepening Depth-First Search (IDDFS) w.r.t. time complexity, space complexity, optimality and completeness. Compute a path to goal state from a root node in a graph given	18 marks

			below using DLS with depth=2 and IDDFS. Depict the stepwise progression of search with neat diagrams. 	
Q. 4.a)	CO4	3	It is 8:5 against the wife who is 45 years old living till she is 75 and 4:3 against her husband now 55 living till he is 80. Find the probability that (i) Both will be alive, (ii) None will be alive, (iii) Only wife will be alive, (iv) Only husband will be alive.	8 marks
	CO4	3	Consider the following Bayesian network, where F stands for Friend and C stands for Caring. 1) Write down the joint probability table specified by the Bayesian network. 2) Find P(C). $P(F) = 0.1$ F → C $P(C \mid F) = 0.8$ $P(C \mid \neg F) = 0.3$	8 marks
Q. 5. a)	CO5	3	Define Fuzzy set. Perform the following Fuzzy Set operations on the given Fuzzy sets: 1) Union, 2) Intersection, and 3) Complement Given Fuzzy sets: P = {(x1 ,0.3), (x2 ,0.9), (x3 ,0)} Q = {(x1 ,0.8), (x2 ,0.4), (x3 ,1)}	8 marks
Q. 5.b)	CO5	4	Compare the following. 1) Classical set theory Vs Fuzzy Set theory 2) Crisp set Vs Fuzzy set	8 marks
Q. 6.a)	CO6	3	Find the local maxima and minima of the function $f(x) = 3x^4 + 4x^3 - 12x^2 + 12$.	6 marks
Q. 6.b)	CO6	3	Compute the output of a 4 inputs x1=4, x2=10, x3=5, x4=20 with weights 1, 2, 3, 4 respectively and bias of 0. The transfer function is given by f(v)= min(500,v).	6 marks
Q. 6.c)	CO6	3	Determine a correct option for weights W={w0, w1, w2} so that the following sigmoid unit will work as an AND gate? 	6 marks