

K. J. Somaiya Institute of Technology, Sion, Mumbai-22
(Autonomous College Affiliated to University of Mumbai)

End Semester Examination: January 2025

Program: M. Tech (Artificial Intelligence)

Scheme: II

Regular Examination: FY

Semester: I

Course Code: Building Blocks of Artificial Intelligence

Course Name: PCEC101

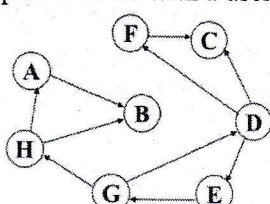
Date of Exam: 22/01/2025

Duration: 2.5 Hours

Max. Marks: 60

Instructions:

- (1) All questions are compulsory.
- (2) Draw neat diagrams wherever applicable.
- (3) Assume suitable data, if necessary.

Ques. No.	Question	Max. Marks	CO	BT Level
Q1	Solve <u>any two</u> questions out of three: (05 marks each)	10		
a)	Sketch State Space Search for Tic Tac Toe problem.		1	U
b)	Sketch the architecture of a Neural Network for COVID prediction.		3	U
c)	Consider the following two Fuzzy Sets A and B defined on the universal set $X = \{1, 2, 3, 4, 5\}$ and perform the fuzzy operations on them: $A = \{(1, 0.2), (2, 0.5), (3, 0.8), (4, 1.0), (5, 0.6)\}$ $B = \{(1, 0.7), (2, 0.4), (3, 0.6), (4, 0.3), (5, 0.9)\}$.		5	A
Q2	Solve <u>any two</u> questions out of three: (05 marks each)	10		
a)	Differentiate soft and hard computing.		2	AN
b)	Consider a genetic algorithm where the solution space is represented by the chromosomes: Chromosome 1: 11010110 and Chromosome 2: 10111001 Apply single-point crossover between Chromosome 1 and Chromosome 2 at crossover point at position 5 and perform mutation on the first offspring by flipping the 5 th bit. Provide the resulting offspring chromosomes.		4	A
c)	Analyze the need of hybrid systems.		6	AN
Q3	Solve <u>any two</u> questions out of three. (10 marks each)	20		
a)	Consider the following graph available with a user:  Apply Depth-First Search algorithm to obtain the Graph's traversal sequence with node D as the source. Show all steps.		1	U

K. J. Somaiya Institute of Technology, Sion, Mumbai-22
(Autonomous College Affiliated to University of Mumbai)

End Semester Examination: January 2025

Program: M. Tech (Artificial Intelligence)

Scheme: II

Regular Examination: FY

Semester: I

Course Code: Building Blocks of Artificial Intelligence

Course Name: PCEC101

Date of Exam: 22/01/2025

Duration: 2.5 Hours

Max. Marks: 60

b)	<p>Consider a fully-connected multilayer feed-forward neural network with architecture 3-2-1. Let the learning rate be 0.7. Assume weights and bias as mentioned below:</p> <table><tr><td>w14</td><td>w15</td><td>w24</td><td>w25</td><td>w34</td><td>w35</td><td>w46</td><td>w56</td><td>θ1</td><td>θ2</td><td>θ3</td></tr><tr><td>0.2</td><td>-0.3</td><td>0.4</td><td>0.1</td><td>-0.5</td><td>0.2</td><td>-0.3</td><td>-0.2</td><td>-0.4</td><td>0.2</td><td>0.1</td></tr></table> <p>Consider a training tuple, X = (1, 1, 0), whose class label is 0. Calculate the net input, output and error of each unit in hidden and output layer once the tuple is fed into the network. Also show updated values of weights and bias after first iteration calculating the error.</p>	w14	w15	w24	w25	w34	w35	w46	w56	θ1	θ2	θ3	0.2	-0.3	0.4	0.1	-0.5	0.2	-0.3	-0.2	-0.4	0.2	0.1	3	U
w14	w15	w24	w25	w34	w35	w46	w56	θ1	θ2	θ3															
0.2	-0.3	0.4	0.1	-0.5	0.2	-0.3	-0.2	-0.4	0.2	0.1															
c)	Analyze the need for combining Genetic Algorithms (GA) and Neural Networks (NN), and explain the hybrid GA-NN approach.	6	AN																						
Q4	Solve <u>any two</u> questions out of three. (10 marks each)	20																							
a)	<p>For the below use cases, state and justify whether to apply supervised or unsupervised learning algorithms:</p> <p>a. Identify abnormal server behavior in a network to detect potential cyberattacks.</p> <p>b. Predict a student’s final grade based on their past academic performance and attendance records.</p>		2	AN																					
b)	Apply Genetic Algorithm for solving Traveling Salesman Problem.		4	A																					
c)	<p>Consider a fuzzy system that defines the water level in a reservoir using the following trapezoidal membership function for the label “Moderate”:</p> $\mu_{\text{Moderate}}(x) = \begin{cases} 0 & \text{if } x \leq 50 \text{ or } x \geq 150, \\ \frac{x-50}{20} & \text{if } 50 < x \leq 70, \\ 1 & \text{if } 70 < x \leq 120, \\ \frac{150-x}{30} & \text{if } 120 < x < 150. \end{cases}$ <p>where x is the water level in centimeters. Perform the following:</p> <p>a. Calculate the membership value of the “Moderate” water level for the following values: 60 cm, 100 cm, and 140 cm.</p> <p>b. Based on your calculations, explain how the fuzzy membership function applies to these water level values.</p>		5	A																					
