DISCIPLINE OF COMPUTER SCIENCE & ENGINEERING
INDIAN INSTITUTE OF TECHNOLOGY INDORE

Spring Semester, 2020-21

Mid Semester Examination

Course Code and Title: CS304N Computational Intelligence

Date (Day): 28/1/2021 (Thursday) **Max. Time Duration: 2 Hrs**

Max. Marks: 30 **Number of Questions: 04**

Number of pages in the Question Paper: 2

Instructions:

1. It is mandatory to use your institute email ID.
2. The group of students are asked to switch on camera for 5 minutes at random for multiple times and proctoring (supervision) will be done through google meet (the link is shared with you)
3. Students are required to submit the complete answer-sheet only **once** in a single PDF file. Resubmission is not allowed.
4. All questions are compulsory. Clearly state the assumptions wherever required with proper justification.
5. Answers must be brief and to the point.

Q. 1

(i) "Global heuristic functions are preferable than local heuristic functions in the informed state space search techniques". Is this statement true? If yes then justify with an appropriate example. [3]

(ii) What is meant by 'supervised learning'? How this kind of learning works in the Perceptron Learning algorithm? Discuss with an example. [4]

Q. 2

(i) "Logic Programming languages are useful for programming decision making problems." Justify this fact by taking one illustrative example.

(ii) Compare and contrast symbolic AI with computational Intelligence by mentioning three points with appropriate discussion. [3+4]

Q. 3

(i) Implement quicksort using Prolog language by assuming a predicate quicksort(A,B), where A is a list of integers should return an ordered list B of A.

(ii) Write a Prolog predicate Fibonacci to compute the n^{th} Fibonacci number. The Fibonacci sequence is defined as follows:

$F0 = 1$

$F1 = 1$

$F(n) = F(n-1) + F(n-2)$ for $n >= 2$

(iii) Write a Prolog code to solve the following:

You are given two jugs, a 4-gallon one and 3-gallon one. Neither has any measuring marks on it. There is a pump that can be used to fill the jugs with water. How can you get exactly 2 gallons of water into the 4-gallon jug?

[2+2+4]

Q. 4 Suppose we have the following data points along with their labels:

$x = (1, -2), t = 1$

$x = (0, -1), t = 0$

The initial weight vector is (0, 2), learning parameter is 1, the bias term is 1 and the threshold for

binary step function is 0. Write down the iterations/steps of the Perceptron learning algorithm to check if network converges or not within 3 epochs with the given conditions. Draw a neat diagram also with final weight updates.

[4+4]