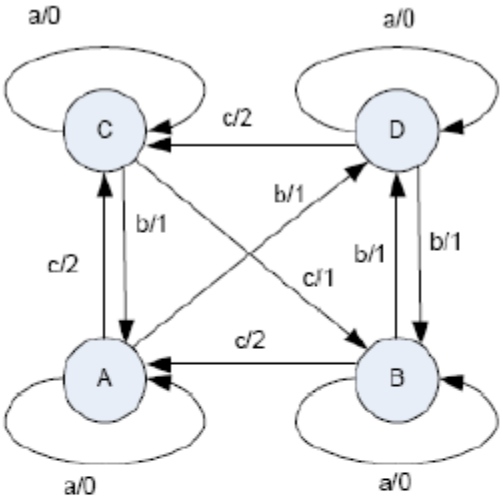
Artificial Intelligence
QUIZ 3 (Section-B)

Date: November 19, 2018 **Marks: 50** **Time: 30 min.**

Q1. a. Suppose we have a **finite state machine** defined by the following graph: (10)



Let the chromosomes for this problem be such that it represents four state-nodes. Each node is represented by 12 bits. The first two bits represent the next state [A = 00, B = 01, C = 10, D = 11] for the case when input = 0, the next two bits represent the output symbol [a = 00, b = 01, c = 10] for this input. The next four bits represent the next state and output symbol for the case when input = 1, and the following four bits represent the next state and output symbol for the case when input = 2. The chromosome has 48 bits, with the first 12 bits reserved for state A, the second 12 bits reserved for state B, the third 12 bits for state C, and the last 12 bits for state D. Assume that the initial state at start up is A. The fitness of each chromosome is measured as the chromosome's ability to correctly predict the next output symbol, given the previous input symbols. What would be the fitness of the chromosome given below, if it is tested on the following sequence of input: Input: 1 1 1 1 0

Chromosome: 0110 1001 0110 1000 0100 0100 0110 1001 0110 0110 1001 0110

b. Suppose that an MLP neural network has a 900-5-100 architecture (900 input neurons, 5 hidden layer neurons and 100 output neurons). Let the processing time of input neurons be negligible. Let the hidden neuron's processing time be 2 seconds per neuron and for the output neuron be 500 milliseconds per neuron. What will be the minimum forward pass processing time, if the MLP is implemented on parallel machines? (4)

c. Find the intersection, union and complements of fuzzy sets A & B: (8)

A = {0/10, 0.6/20, 1/30, 1/40, 0.3/50, 0.1/60, 0/70, 0/80, 0.5/90, 1/100}

B = {1/10, 0.5/20, 0/30, 0/40, 0.1/50, 0.3/60, 1/70, 1/80, 0.6/90, 0/100}

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Q2. Implement **k-medoid algorithm** on the data given in Figure 1. The value of k is 2. Use Euclidean distance as the distance measure. (28)

$$\mathrm{d}(\mathbf{p}, \mathbf{q}) = \sqrt{(q_1 - p_1)^2 + (q_2 - p_2)^2}.$$

Individual	Variable 1	Variable 2
1	1.0	1.0
2	1.5	2.0
3	3.0	4.0
4	5.0	7.0
5	3.5	5.0
6	4.5	5.0
7	3.5	4.5

Figure 1