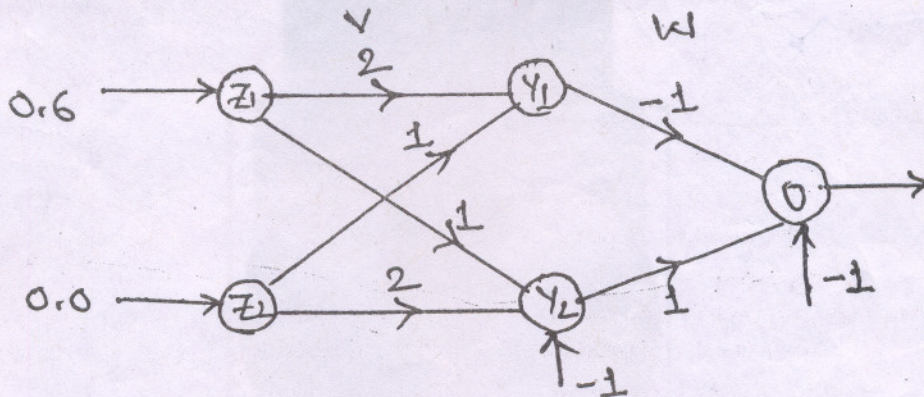


(Library)

Neural Networks & Fuzzy Systems.

- N.B.** (1) Question No. 1 is **compulsory**.
 (2) Attempt any **four** out of remaining **six** questions.
 (3) Assume **suitable** data wherever **required** and **justify** it.

- (a) Explain any four Defuzzification methods. **10**
 (b) Explain Out star learning rule and Widro Hoff learning rule. **10**
- Design the fuzzy controller to control the feed amount of the coagulant for the water purification plant. Raw water is purified by injecting chemicals at rates related to water quality. Aluminium sulphate or PAC (polymerized aluminium chloride) is used as coagulant. Aluminium sulphate is less expensive than PAC but is not effective in low temperature water. Assume inputs water temperature(cold,normal,hot) and grade of water (low, medium and high), output variable amount of coagulant (small, medium, large). Derive the rule for control action and defuzzification. The design should be supported by figure whenever necessary. Clearly indicate that if water temperature is low and grade of water quality is low than PAC is used in large amount. **20**
- (a) List out the concept of learning rules and state their properties such as single weight adjustment, type of learning, neuron characteristics, etc. **10**
 (b) Explain the perceptron convergence algorithm for the single layer perceptron. **10**
- (a) Explain Error back propagation algorithm with the help of flow chart. **8**
 (b) Apply Error back propagation algorithm to update the weights in the following, diagram. Assume $z = [0.6 \ 0]$, $w = [-1 \ 1]$, $w_0 = [-1]$, $v = [2 \ 1; 1 \ 2]$, $v_0 = [0; -1]$, $d = 0.9$, learning rate = 0.3 and use unipolar sigmoid function. **12**



- (a) Explain Radial basis function network and compare with MLP. **10**
 (b) Explain architecture of BAM. How is storage and retrieval performed in BAM ? **10**
- (a) Discuss in detail Hopfield network. **10**
 (b) Prove the following identities :— **10**
 - for unipolar continuous activation function $f'(net) = O(1 - O)$
 - for bipolar continuous activation function $f'(net) = O(1 - O^2)/2$
 Where O is output ?
- Write short note on (any two) :— **20**
 - Character recognition using neural network
 - Fuzzy relation
 - LMS algorithm
 - Boltzmann machine.