# GANPAT UNIVERSITY
## M. TECH SEM. I (COMPUTER ENGINEERING)
## CBCS REGULAR EXAMINATION NOV – DEC 2017
### 3CE101 : COMPUTATIONAL INTELLIGENCE

**Total Time: 3 hours**                                                           **Total Marks: 60**

**Instructions:**
1. Write each section in separate answer sheet.
2. Figure to the right indicates full marks.
3. Assume suitable data wherever necessary.

## SECTION – I

**Q – 1 (a)** Discuss the following terms with example: **(4)**

     i) Knowledge                                ii) Combinatorial explosion
     iii) Heuristic function                      iv) Ridge

**(b)** You are given two jugs of water, 4-litre and 3-litre. Neither has any measuring mark on it. There is a pump that can be used to fill the jugs with water. How can you get exactly 2-litre of water into the 4-litre jug? Solve and suggest the appropriate strategy for the given water-jug problem. **(6)**

### OR

**Q – 1 (a)** Solve the 4-Queens problem using state space search. Draw the entire state space search tree. **(6)**

**(b)** Describe the simulated annealing approach. **(4)**

**Q – 2 (a)** Explain with an example of a problem for which depth first search would work better than breadth first search. **(5)**

**(b)** Describe the problem of over-estimation and under-estimation with A* algorithm. **(5)**

### OR

**Q – 2 (a)** Discuss hill-climbing approach along with its disadvantages. **(4)**

**(b)** Consider the following 8-puzzle problem. Solve it by applying appropriate heuristic function. Show each solution step. **(6)**

| 1 | 2 | 3 |
|---|---|---|
| 8 | 5 | 6 |
| 4 | 7 |   |

Initial

| 1 | 2 | 3 |
|---|---|---|
| 4 | 5 | 6 |
| 7 | 8 |   |

Goal

**Q – 3 (a)** Check whether the following problems are decomposable or not. Justify your answers also: **(4)**

     i) Chess        ii) Tower of Hanoi        iii) Water-jug        iv) 8-puzzle

**(b)** Explain best first search with example. **(4)**

**(c)** Discuss the characteristics of control strategy. **(2)**

**Q – 4 (a)** Solve the following problem using constraint satisfaction: **(6)**

$$D\ O\ N\ A\ L\ D$$
$$+\ G\ E\ R\ A\ L\ D$$
$$------------------$$
$$R\ O\ B\ E\ R\ T$$

**(b)** Explain the following terms with respect to fuzzy logic **(4)**
   i) Grade of membership          ii) Universe of discourse

**OR**

**Q – 4 (a)** Discuss α-β pruning with appropriate example. **(5)**

**(b)** Explain various membership functions used for fuzzy logic. **(5)**

**Q – 5 (a)** Train a perceptron using perceptron learning rule for logical AND gate truth table. **(6)**
Perform 2 epochs. Initial weights and bias are zero. Assume learning rate of 0.5. If required, assume suitable data and clearly mention the assumptions.

**(b)** Differentiate between the followings: **(4)**

   i) Supervised learning v/s Unsupervised learning
   ii) Biological neural network v/s Artificial neural network

**OR**

**Q – 5 (a)** Develop an ADALINE network for the following data with bipolar inputs and bipolar **(8)**
targets. Assume initial weights and bias as 0.3. Set learning rate 0.4. Calculate up to 2 epochs and find average mean squared error.

| $X_1$ | $X_2$ | T |
|-------|-------|------|
| 1 | 1 | 1 |
| 1 | -1 | -1 |
| -1 | 1 | -1 |
| -1 | 1 | -1 |

**(b)** Discuss the sigmoid function as an activation function for artificial neural network. **(2)**

**Q – 6 (a)** What is back propagation in artificial neural network? Explain the entire process of back **(6)**
propagation algorithm.

**(b)** Write and prove Fuzzy Demorgan's law. **(4)**

**END OF PAPER**