Reg.No. \_\_\_\_\_\_\_\_\_\_\_\_

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**End Semester Examination – Nov/Dec – 2018**

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| **Code :** | **17MA2014** | **Duration :** | **3hrs** |
| **Sub. Name :** | **FUZZY SETS AND LOGIC** | **Max. marks :** | **100** |

**ANSWER ALL QUESTIONS (5 x 20 = 100 Marks)**

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| **Q. No.** | **Sub Div.** | **Questions** | **Course**  **Outcome** | **Marks** |
| 1. | a. | Prove that a fuzzy set *A* in *R* is convex if and only if for all and for all . | CO1 | 10 |
| b. | State and prove the Second Decomposition Theorem. | CO1 | 10 |
| (OR) | | | | |
| 2. | a. | Let A be a fuzzy set defined on the set X where . Represent A using First decomposition Theorem | CO2 | 10 |
| b. | Let a function satisfies the axioms c2 and c4. Prove that c also satisfies axioms c1 and c3. Show that c must be a bijective function. | CO2 | 10 |
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| 3. | a. | Consider the fuzzy sets A, B and C defined on X = [0,10] of real numbers by the membership grade functions ,  , . Compute (i) (ii) (iii) (iv) (v) | CO1 | 10 |
| b. | Prove that for all , *min (a,b)* where denotes the drastic intersection. | CO1 | 10 |
| (OR) | | | | |
| 4. |  | Prove that is a dual triple with respect to any fuzzy complement *c*. | CO2 | 20 |
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| 5. | a. | Let A = [1, 2], B = [ – 1, 1] and C = [3,5]. Verify the commutativity, associativity of addition and multiplication and sub-distributivity. | CO3 | 10 |
| b. | For the intervals A = [1, 2], B = [– 1, 5], C = [3, 4], D = [2, 6], verify the inclusion monotoncity properties. | CO3 | 10 |
| (OR) | | | | |
| 6. |  | Let A and B be two triangle-shape fuzzy numbers defined as follows and  Find the fuzzy numbers (A + B), (A – B), (A.B) and (A/B). | CO4 | 20 |
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| 7. | a. | Prove that is a tautology. | CO4 | 10 |
| b. | For the three valued logic, find the truth values in T3 for negation, conjunction, disjunction, implication and equivalence. | CO4 | 10 |
| (OR) | | | | |
| 8. | a. | Let X = {1, 2, 3, 4} and Y = {1, 2, 3, 4, 5, 6}. Define ; ; . Apply the fuzzy modes ponens rule and the relation, prove the following.   1. If X is A, then Y is B. 2. If X is A, then Y is B else Y is C. | CO5 | 10 |
| b. | Write a short note on fuzzy propositions. | CO5 | 10 |
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|  | | **Compulsory**: |  |  |
| 9. | a. | Explain the inference and defuzzification methods used in fuzzy controllers. | CO5 | 10 |
| b. | Write a note on fuzzy neural network and fuzzy automata. | CO6 | 10 |