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



**End Semester Examination – Nov / Dec – 2019**

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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. | A, B and C are three fuzzy sets defined on X = {x1, x2, x3, x4, x5, x6, x7, x8, x9, x10} as follows.  ;  B = ;  C = ;  Find (i) , , (ii) , , (iii) ,  , (iv) , , | CO1 | 20 |
| **(OR)** | | | | |
| 2. | a. | State and prove First Decomposition theorem. Let A be a fuzzy set defined on the set X where . Represent A using First decomposition Theorem. | CO1 | 20 |
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| 3. | a. | For the fuzzy sets and  , compute ,, ,  , , , , , and . | CO2 | 20 |
| **(OR)** | | | | |
| 4. | a. | Prove that for all , *max (a,b)* where denotes the drastic union. | CO2 | 10 |
| b. | Prove that the standard fuzzy intersection is the only idempotent  t – norm. | CO2 | 10 |
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| 5. | a. | For the fuzzy sets  A = {(a, 0.7), (b, 0.3), (c, 0.5), (d, 0.1), (e, 1.0), (f, 0.35), (g, 0.66), (h, 0.34), (i, 0.8), (j, 0.2)} and  B = {(a, 0.1), (b, 0.7), (c, 0.4), (d, 0.9), (e, 0.7), (f, 0.45), (g, 0.22), (h, 0.46), (i, 0.5), (j, 0.41)}, find standard fuzzy union, algebraic sum, bounded sum and drastic union of A and B. | CO3 | 10 |
| b. | Given A = [-3, 2], B = [1, 6], C = [4, 6], verify the commutative and associative operations for addition and multiplication and sub - distributivity of the above intervals. | CO3 | 10 |
| **(OR)** | | | | |
| 6. | a. | Prove that is a tautology. | CO3 | 10 |
| b. | For the three valued logic, find the truth values in T3 for negation, conjunction, disjunction, implication and equivalence. | CO3 | 10 |
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| 7. | a. | 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 |
| **(OR)** | | | | |
| 8. | a. | and . Then find the relation “If A, then B” using (i) Lukasiewicz implication (ii) Mamdani implication (iii) Kleene-Dienes implication | CO4 | 10 |
| b. | Let X = {u, v, w, x} and Y = {u, v, w, x, y, z}. Define  ; ; . Apply the fuzzy modes ponens rule and the relation   1. If X is A, then Y is B. 2. If X is A, then Y is B else Y is C. | CO4 | 10 |
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|  | | **Compulsory**: |  |  |
| 9. | a. | Explain the inference and defuzzification methods used fuzzy controllers. | CO5 | 10 |
| b. | Write a note on fuzzy neural network and fuzzy automata. | CO6 | 10 |