



Date: 23-06-2022

Dept. No.

Max. : 100 Marks

Time: 09:00 AM - 12:00 NOON

**PART-A**

(10 × 2 = 20)

Answer all the questions

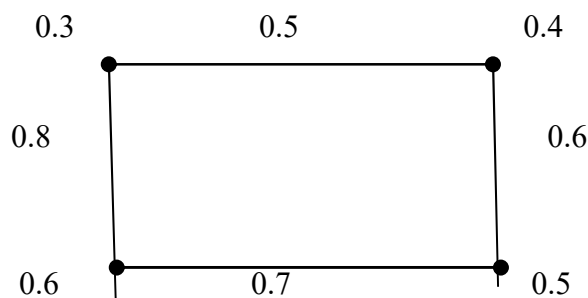
1. Define Fuzzy sets and give one example.
2. Define fuzzy relation with an example.
3. For the given sets, find the generalized hamming distance.  
 $\tilde{A} = \{(x_1, 1), (x_2, 0.8), (x_3, 0.2), (x_4, 0.8), (x_5, 0.6), (x_6, 0.3), (x_7, 0.5)\}$   
 $\tilde{B} = \{(x_1, 0.8), (x_2, 0.3), (x_3, 0.6), (x_4, 0.5), (x_5, 0.4), (x_6, 0.7), (x_7, 0.6)\}$
4. Explain the similarities between a neuron and synoptic matrix.
5. Define limit cycle and a fixed point.
6. What is the difference between the FCM and the FRM model?
7. State the difference between the ordinary graph and the fuzzy graph.
8. Define ordinary subset nearest to a fuzzy subset and construct the ordinary subset nearest to the fuzzy subset  $\tilde{A} = \{(x_1, 0.8), (x_2, 0.3), (x_3, 0.7), (x_4, 1), (x_5, 0), (x_6, 0.2)\}$
9. Define ordinary relation closest to a fuzzy relation and give an example.
10. Explain the symmetric property in fuzzy relation

**PART-B**

(5 × 8 = 40)

Answer any 5 Questions

11. Explain projection with an example and when does it become a normal projection.
12. Find the disjunctive sum for the following two fuzzy subsets  
 $\tilde{A} = \{(x_1, 1), (x_2, 0.8), (x_3, 0.2), (x_4, 0.8), (x_5, 0.6), (x_6, 0.3), (x_7, 0.5)\}$   
 $\tilde{B} = \{(x_1, 0.8), (x_2, 0.3), (x_3, 0.6), (x_4, 0.5), (x_5, 0.4), (x_6, 0.7), (x_7, 0.6)\}$
13. State and prove the decomposition theorem on fuzzy relations
14. Explain strongest path in a fuzzy graph with an example.
15. Find the order, size and degree and complement for the following graph.



16. Considering the fuzzy similitude relation  $\tilde{R}$ , and choosing three quantities  $a$ ,  $b$ , and  $c$  as the following :  $a = \mu_{\tilde{R}}(x, y) = \mu_{\tilde{R}}(y, x)$ ;  $b = \mu_{\tilde{R}}(y, z) = \mu_{\tilde{R}}(z, y)$ ;  $c = \mu_{\tilde{R}}(z, x) = \mu_{\tilde{R}}(x, z)$ . Prove that  $c \geq a = b$  or  $a \geq c$  or  $b \geq c = a$ .
17. Explain the various types of fuzzy numbers.
18. With a suitable example explain the FCM

**PART-C**

**(2 × 20 = 40)**

**Answer any 2 Questions**

19. Let  $\tilde{A} = \{(x_1, 1), (x_2, 0.8), (x_3, 0.2), (x_4, 0.8), (x_5, 0.6), (x_6, 0.3), (x_7, 0.5)\}$

$\tilde{B} = \{(x_1, 0.8), (x_2, 0.3), (x_3, 0.6), (x_4, 0.5), (x_5, 0.4), (x_6, 0.7), (x_7, 0.8)\}$

$\tilde{C} = \{(x_1, 0), (x_2, 0.5), (x_3, 0.2), (x_4, 0.7), (x_5, 0.6), (x_6, 0.9), (x_7, 0.1)\}$

Calculate i)  $(\tilde{A} \cup \tilde{B}) \cap \tilde{C}$  ii)  $(\tilde{A} \cap \tilde{B}) \cup \tilde{C}$  iii)  $(\overline{\tilde{A} \cap \tilde{B}}) \cup \tilde{C}$  iv)  $\tilde{A} \circ \tilde{B} \circ \tilde{C}$

v)  $\hat{\tilde{A}} + \hat{\tilde{B}} + \hat{\tilde{C}}$

20. Find  $\tilde{R}_1 \circ \tilde{R}_2 \circ \tilde{R}_3$  where  $\circ$  is the max-min composition

$\tilde{R}_1$	$Y_1$	$Y_2$	$Y_3$	$Y_4$	$Y_5$
$X_1$	0.2	0.3	0.8	0.6	0.1
$X_2$	0.3	0.8	0.6	0.6	1
$X_3$	0.2	1	0.4	0.1	0

$\tilde{R}_2$	$Z_1$	$Z_2$	$Z_3$	$Z_4$
$Y_1$	1	0.2	0.3	0.4
$Y_2$	0.4	1	0.1	0.2
$Y_3$	0.3	0.4	1	0.1
$Y_4$	0.2	0.3	0.4	1
$Y_5$	1	0.2	0.3	0.4

$\tilde{R}_3$	$T_1$	$T_2$	$T_3$	$T_4$	$T_5$
$Z_1$	0.9	0	0.3	0.4	0.5
$Z_2$	0.9	0.6	0.4	0.7	0.6
$Z_3$	0	0.8	0.9	0.3	0.7
$Z_4$	0.3	1	0.1	0.4	1

21. Define fuzzy graph and explain the different aspects with examples.
22. Using any fuzzy model, analyze any social / medical / environmental / educational / economic issues in detail and interpret your findings.

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