

JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT
TEST - 3 EXAMINATION (December 2025)

B.Tech. - VIII Semester

COURSE CODE (CREDITS): 21B1WMA831 (3)

MAX. MARKS: 35

COURSE NAME: SOFT COMPUTING & OPTIMIZATION TECHNIQUES

COURSE INSTRUCTORS: RKB*

MAX. TIME: 2 Hrs

Note: All questions are compulsory. Use of scientific calculator is allowed. The candidate is allowed to make suitable numeric assumptions wherever required for solving problems.

Q.No	Question	CO	Marks
Q1	Draw the basic diagram for the concept of computing and write their important characteristics.	CO-1	3
Q2	Find the cardinality of the fuzzy set A whose membership function is given as $\mu_A(x) = \begin{cases} 0 & ; 0 \leq x \leq 2 \\ (x-2)/2 & ; 2 < x < 4 \\ 1 & ; 4 \leq x \leq 6 \\ (8-x)/2 & ; 6 < x < 8 \\ 0 & ; x \geq 8 \end{cases}$ Also plot the membership function of fuzzy set A	CO-2	3
Q3	Suppose you have a set of data points representing the humidity level (%), and you want to create a fuzzy membership function to determine the likelihood that the humidity is "high". Using a triangular membership function with the following parameters: <ul style="list-style-type: none"> Minimum humidity for "high": 50% Moderate humidity for "high": 70% Maximum humidity for "high": 90% (a) Write the equation for the triangular membership function. (b) If the current humidity is 65%, what is the degree of membership for "high"? (c) If the current humidity is 95%, what is the degree of membership for "high"?	CO-3	4
Q4	Suppose we are using binary encoding in a genetic algorithm to optimize a function of three variables a , b , and c , where each variable can take values in the range $[0, 10]$ with a precision of 0.2. If we use 7 bits to encode each variable, what is the maximum number of possible solutions that can be represented using this binary encoding scheme?	CO-5	2
Q5	A roulette wheel selection mechanism in a genetic algorithm has the following selection probabilities for four chromosomes: a. Chromosome C1: 30% probability of being selected b. Chromosome C2: 10% probability of being selected c. Chromosome C3: 25% probability of being selected d. Chromosome C4: 35% probability of being selected If we need to select 12 parents for the next generation using this roulette wheel: (a) What is the probability of selecting chromosome C1 exactly twice in 12 spins of the roulette wheel?	CO-4	8

	<p>(b) What is the probability of selecting chromosome C2 at least three times in 12 spins?</p> <p>(c) What is the expected number of times chromosome C3 will be selected in 12 spins?</p> <p>(d) If we spin the roulette wheel 12 times, how many parents are expected to be selected from chromosome C4?</p>		
Q6	Design a neural net that classifies a sample as belonging to class 1 if the sample produces a positive value for $D = 34 + 8x_1 - 7x_2 + x_3$, and classifies the sample as belonging to class 0 if the sample produces a negative value for D .	CO-5	7
Q7	Compute the average-linkage distance between the two clusters ($\{3, 4\}, \{5, 6\}$) and ($\{1, 1\}, \{2, 2\}$), using city block distance between points. Also, find by using Euclidean distance between points.	CO-5	4
Q8	Draw the flow chart of standard genetic algorithm.	CO-4	4
