UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
Term End Semester Examination, December 2018

Programme Name: M.Tech. (CSE) **Semester** : 1st
Course Name   :   Fuzzy logic and Applications **Time** : 03 hrs
Course Code   :   CSAI 7004 **Max. Marks :** 100
Nos. of page(s) :   Two
Instructions   :   **All questions are compulsory. This question paper contains 11 questions.**

SECTION A

S. No.		Marks	CO
Q 1	Define and compare a Crisp set and a Fuzzy set.	4	CO1
Q 2	Why do we need type-2 fuzzy sets?	4	CO2
Q 3	Why shall we use fuzzy logic for solving engineering problems?	4	CO1
Q 4	Take your own two examples how fuzzy logic can be a better approach for understanding and solving day-to-day problems of a human being.	4	CO3
Q 5	How would you select an appropriate criteria for selecting an appropriate aggregation operator?	4	CO4

SECTION B

Q 6	Contrast and discuss fundamental properties of a Crisp set operations like commutativity, associativity etc. Take your own example to discuss all these.	10	CO1
Q 7	Discuss basic types of a fuzzy set like membership function, Interval-valued fuzzy sets. Take your own example say height of the students etc. in support of your answer.	10	CO2
Q 8	A person is driving a car on a cold winter day down a road. Suddenly, a dog jumps in front of the car. The driver can decide between two actions: he can break hard applying full power to the brakes, or he can brake soft knowing that the car cannot come to a stop before a collision with the animal. {slippery road, not slippery road} {brake soft, brake hard} Apply fuzzy logic for decision making of the above case study.	10	CO3
Q 9	Draw a block diagram for the remote control thermostat. Include as much detail as possible. Be sure to consider what ports the I/O devices are connected to. Be sure to include all external circuitry (Sensors, amplifiers, filters, DACs, logic, etc.). You may assume the existence of any component that you need as long as you describe what it does.	10	CO4

	OR		
	By giving your own example, draw a light on Fuzzy numbers and Fuzzy arithmetic.		

SECTION-C

Q 10	Assume that the control of the heating and cooling device takes a 12-bit value where 0 represents the coolest setting and 4096 represents the warmest. The value is transmitted from the remote to the heating and cooling device using the infrared transmitter. Design a fuzzy logic controller that attempts to find the correct setting for the heating and cooling device which matches the desired temperature. Be creative in your controller design. If not so you can use your own predictions for the solution of above problem. (a) What are your control inputs and outputs? (b) What crisp inputs will you use? (c) What input fuzzy membership sets will you use? (d) What output fuzzy membership sets will you use? (e) Give four example fuzzy rules.	20	CO3
Q 11	Take your own assumptions and constraints for solving the problem of Room Air-conditioner using fuzzy logic. Draw necessary Membership functions, rule base, surface viewer, Rule table etc. for the above problem. <center>OR</center> Take your own assumptions and constraints for solving the problem of Traffic lights using fuzzy logic. Draw necessary Membership functions, rule base, surface viewer, Rule table etc. for the above problem.	20	CO3 CO4

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Name of Examination (Please tick, symbol is given)	:	MID	NA	END	E	SUPPLE	NA
Name of the School (Please tick, symbol is given)	:	SOE		SOCS	E	SOP	

Programme	:	M.Tech. (CSE)
Semester	:	1st
Name of the Course	:	Fuzzy Logic and Applications
Course Code	:	CSAI 7004
Name of Question Paper Setter	:	Alok Aggarwal
Employee Code	:	40001740
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Note: Please mention additional Stationery to be provided, during examination such as Table/ Graph Sheet etc. else mention "NOT APPLICABLE": NOT APPLICABLE

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Note: - Pl. start your question paper from next page

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SECTION A

S. No.		Marks	CO
Q 1	Discuss three basic methods to define sets.	4	CO2
Q 2	Compare and contrast type-1 and type-2 fuzzy sets?	4	CO1
Q 3	Discuss briefly about the de-fuzzification process.	4	CO3
Q 4	The room temperature is hot. Here the hot (use of linguistic variable is used) can be represented by _____ a) Fuzzy Set b) Crisp Set c) Fuzzy & Crisp Set d) None of the mentioned Give a proper reasoning in support of your answer.	4	CO4
Q 5	What is sequence of steps taken in designing a fuzzy logic machine?	4	CO1
	SECTION B		
Q 6	Let there be seven levels of education: 0 – no education 1 – elementary school 2 – high school 3 – two-year college degree 4 – bachelor's degree 5 – master's degree 6 – doctoral degree	10	CO3

	Design and discuss membership functions for the above case for getting how educated a person is.		
Q 7	Discuss basic types of a fuzzy set like membership function, Interval-valued fuzzy sets for solving a problem how old a person is.	10	CO1
Q 8	Draw and discuss the block diagram of a fuzzy inference system. Clearly mention and briefly describe each of these sub-components.	10	CO2

Q 9	A Company makes two products:
	
	  P1 with profit $0.40 per unit.
	  P2 with profit $0.30 per unit.
	
	P1 takes twice time to produce compared to P2.
	
	Total labor time per day is 500 hours. It can be extended to 600 hours with overtime work. Supply of material is sufficient for 400 units of both products, but it can be extended to 500 units per day.
	
	Use fuzzy logic application for maximizing the profit of the above company.
	
	OR
	
	By giving your own example draw a light on Fuzzy numbers and Fuzzy arithmetic.
		10	CO4

	SECTION-C		
Q 10	Take your own assumptions and constraints for solving the problem of Washing Machines using fuzzy logic. Draw necessary Membership functions, rule base, surface viewer, Rule table etc. for the above problem.	20	CO3
Q 11	Take your own assumptions and constraints for solving the problem of Traffic lights using fuzzy logic. Draw necessary Membership functions, rule base, surface viewer, Rule table etc. for the above problem. (a) What are your control inputs and outputs? (b) What crisp inputs will you use? (c) What input fuzzy membership sets will you use? (d) What output fuzzy membership sets will you use? (e) Give four example fuzzy rules. OR Take your own assumptions and constraints for solving the problem of Waiter Tip Problem in a restaurant using fuzzy logic. Draw necessary Membership functions, rule base, surface viewer, Rule table etc. for the above problem.	20	CO4 CO3