Sr. No. 009801

27/05/2023 (M)

May 2023

B.Tech.EIC 8th Semester(Re-Appear)

FUZZY CONTROL SYSTEM (EIC-410)

Max. Marks:60

Time: 3 Hours

Instructions:
1. *It is compulsory to answer all the questions (1.5 marks each) of Part -A in short.*
2. *Answer any four questions from Part -B in detail.*
3. *Different sub-parts of a question are to be attempted adjacent to each other.*
4. *Assume relevant data if not mentioned.*

PART-A

Q.1.a Let X={a,b,c,d}, what is the cardinality of X and its power set P(X). (02)

Q.1.b For fuzzy set $\widetilde{A}$, prove that $\widetilde{A} \cup \bar{\widetilde{A}} \neq X$ (Universe of discourse). (02)

Q.1.c For fuzzy set$\widetilde{A}$, prove that $\widetilde{A} \cap \bar{\widetilde{A}} \neq \emptyset$ (Null). (02)

Q.1.d Write any two properties of fuzzy sets. (02)

Q.1.e Let fuzzy set$\widetilde{A} = \{\frac{0.5}{1} + \frac{0.6}{2} + \frac{0.7}{3}\}$ and $\widetilde{B} = \{\frac{0.4}{1} + \frac{0.8}{2} + \frac{0.9}{3}\}$. Find out $\widetilde{A} \cup \widetilde{B}$ and $\widetilde{A} \cap \widetilde{B}$. (02)

Q.1.f Let fuzzy set$\widetilde{A} = \{\frac{0}{1} + \frac{0.6}{2} + \frac{0.3}{3} + \frac{0.4}{4} + \frac{0.1}{5} + \frac{0.8}{6} + \frac{0.9}{8}\}$. Perform Defuzzification by using centre of gravity rule. (02)

Q.1.g What are non interactive fuzzy sets? (02)

Q.1.h Write identity and universal relations for A={1,2,3} (02)

Q.1.i Explain crisp Equivalence Relation . (02)

Q.1.j Write down the properties of fuzzy numbers. (02)

PART-B

Q.2 Let fuzzy set$\widetilde{A} = \{\frac{0.6}{2} + \frac{1}{3} + \frac{0.2}{4}\}$, $\widetilde{B} = \{\frac{0.4}{2} + \frac{1}{3} + \frac{0.8}{4} + \frac{0.3}{5}\}$, and $\widetilde{C} = \{\frac{0.3}{1} + \frac{0.5}{2} + \frac{0.6}{4} + \frac{0.5}{5}\}$. Find out "If X is $\widetilde{A}$ *then* Y is $\widetilde{B}$ ", and the compound proposition "If $\widetilde{A}$ *then*$\widetilde{B}$ *else* $\widetilde{C}$ ". Fuzzy sets $\widetilde{A}$ and $\widetilde{B}$ are defined on universe of discourse X and Y, respectively. (10)

Q.3 Explain the following inference engines: (10)

a) Composition based inference
b) Individual rule firing based inference

Q.4 Explain PID type FKBC design. (10)

Q.5 Explain the principal structure of a FKBC by using block diagram. (10)

Q.6 Explain performance monitoring by using parameter estimators in adaptive fuzzy controllers. (10)

Q.7 Explain state space approach for stability analysis of fuzzy control systems. (10)