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106801

May 2019

B.Tech. VIII Semester

FUZZY CONTROL SYSTEM

(EIC-401)

Time : 3 Hours]

[Max. Marks : 60

Instructions :

(i) It is compulsory to answer, in brief, all the questions (2 marks each) of Part-A.

(ii) Answer any four questions from Part-B in detail.

(iii) Different sub-parts of a question are to be attempted adjacent to each other.

(iv) May ask for Graph Sheet, if required.

PART–A

1. (a) What are the essential elements of a knowledge based controller? (2)

(b) Define extension principle for fuzzy logic systems. (2)

(c) What is the need of fuzzification & de-fuzzification? (2)

(d) In TSK or Sugeno type of fuzzy system, is the rule consequent specified by fuzzy set? If not, then by what is it specified? (2)

(e) Do linear controllers suffice to give reasonably good performance in controlling non-linear systems? If not, then what kind of controllers are required for controlling non-linear systems? (2)

(f) The overlap amongst how many adjacent fuzzy sets is "usually" allowed and "at the most", how many fuzzy sets can overlap? (2)

(g) State the form of a typical rule. Are the rules in a rule base generally ANDed orORed? (2)

(h) What are the ways to obtain rules? (2)

(i) What are the ways to obtain membership functions? (2)

(j) What extra components exist in an adaptive FKBC over and above a non-adaptive FKBC? (2)

PART–B

2. (a) If "A" is a classical set & "AC" is its complement, then what is the result of :

(i) (A) intersection (AC) ?

(ii) (A) union (AC) ?

Now suppose the set "A" is a fuzzy set, then what difference(s) is (are) caused in the above two operations? (5)

(b) Distinguish, at least in 5 respects, between fuzzy theory and probability theory. (5)

3. (a) What do you mean by fuzzy implication? Cite an example /illustration. (3)

(b) Define Compositional Rule of Inference & illustrate with a case. (7)

4. Show how the following blocks of FKBC are non-linear:
   (a) Fuzzification
   (b) Rule firing or inferencing
   (c) De-fuzzification.

   Also state whether input variable scaling is non-linear or linear operation? (10)

5. (a) Explain membership function tuning using gradient descent method. (8)
   (b) What performance criteria can be adopted in membership function tuning? (2)

6. (a) How can state space approach be applied to assess stability of FKBCs? (5)
   (b) Explain any *two* robustness indices. (5)

7. (a) Write detailed note on : Takagi-Sugeno FKBC. (6)
   (b) Compare any *two* de-fuzzification methods. (4)
