GROUP DECISION MAKING UNDER MULTIPLE CRITERIA

MIDTERM EXAM

15.04.2014

You may use lecture notes and other related printed sources as well as your computer for soft documents and mathematical calculations. You should turn of internet property of the computer.

QUESTIONS

1) Formulate a *mathematical programming model* for Project Selection Problem alternative to Cook & Seiford's Ordinal Intersection Method. (define and explain decision variables, objective function, and constrains)

Given information:

i=1,2,..., n individuals,
j=1,2,…, m projects,
k=1,2,…,s criteria,
r_{ij}^k: preference ranking of individual i of alternative j with respect to criterion k,
C_j = cost of project j,
B = total budget.
(you are free to assume other related parameters)

2) We had a municipality elections two weeks ago. Which method is used to select the major in the municipality elections in Turkey? What may be the other alternative methods? Give three alternative methods and explain advantages and disadvantages of all four methods.

3) Which of Arrow's conditions are not satisfied in Dodgson's Social Choice Function? Give an example to support your answer for one of the condition(s).

4) The Industrial Engineering Department of ITU evaluates the applications for PHD Program. Five attributes are employed to rank the six candidates, two of which will be accepted to the program. The head of department thinks that the selected candidates should meet some standard value from all of the attributes. What kind of OWA operator can be used for this purpose? (i.e. min like or max like operator?) Propose an OWA operator according to your previous answer. Calculate the orness score for this operator. Use this operator to rank the candidates.

	Toefl Score	Reputation of the graduate University	GPA	ALES	Interview score
Candidate 1	107	7	3,8	83	7,9
Candidate 2	102	6	3,49	81	5,7
Candidate 3	114	6	3,73	90	4,4
Candidate 4	98	8	3,29	98	5,3
Candidate 5	113	8	3,31	83	6,6
Candidate 6	92	3	3,16	93	7,8

5) Consider the problem in question 4. Use PROMETHEE II method to rank the candidates if the generalized criteria are defined for the attributes as follows (assume all attributes are equally important):

Attribute	Generalized criteria	Parameters
Toefl Score	V-sharp	p = 20
Reputation of the graduate University	Usual	
GPA	Quasi	q =0.3
ALES	Linear	q = 3, p = 10
Interview score	Quasi	q = 1

6) Consider the problem in question 4. Suppose that instead of a unique interview score for each candidate, the PHD committee composed of three professors evaluated the candidates according to their own criteria in the scale they defined (see the evaluations of the professors in the following). What kind of method can be used to rank the candidates? Use the method you offered to rank the candidates (make necessary assumptions to answer the question).

Professor 1: (1-7 Scale)

	Presentation	Answers to questions	Good looking
Candidate 1	7	3	5
Candidate 2	5	6	4
Candidate 3	4	2	7
Candidate 4	6	3	6
Candidate 5	3	4	3
Candidate 6	6	7	4

Professor 2: (1-10 Scale)

	First impressions	Answers to questions
Candidate 1	5	3
Candidate 2	3	4
Candidate 3	8	6
Candidate 4	9	4
Candidate 5	10	8
Candidate 6	8	4

Professor 3: (1-5 Scale)

	Academic knowledge	Adequateness
Candidate 1	4	3
Candidate 2	3	2
Candidate 3	3	4
Candidate 4	1	5
Candidate 5	5	4
Candidate 6	5	3