

GROUP DECISION MAKING UNDER MULTIPLE CRITERIA

FINAL EXAM

Assoc. Prof. Özgür Kabak

June 18, 2021

Due date: June 28, 2021, 18:00

Please submit your files to ninova before 18:00.

All questions related to the questions are welcomed via e-mail (ozgurkabak@gmail.com), via WhatsApp (0532-4274535) or by direct phone call (0532-4274535).

This is an individual exam. Do not cheat! Academic misconduct or cheating will not be tolerated!

- *You may use printed lecture notes and other related sources and related files. You may use excel for calculations.*
- *Do not communicate or share files with your peers.*

Instructions:

- You may answer the questions on word file or handwritten on a paper, and use excel for calculations.
- You have to convert the word file or handwritten papers to a pdf file to upload to Ninova.
- If you use excel, please prepare a single excel file. Each question should be in a separate sheet.
- Please upload your answers to Ninova as a single pdf file and an excel file.

QUESTIONS

1. (30 points) The results of the parliament elections on November 1, 2015 for Istanbul 1, Istanbul 2, and Istanbul 3 regions are given in the excel file. Total number of seats allocated to these regions are 31, 26, and 31 respectively. In that election only CHP, MHP, HDP, and AK parti has passed the 10% election threshold in general voting.

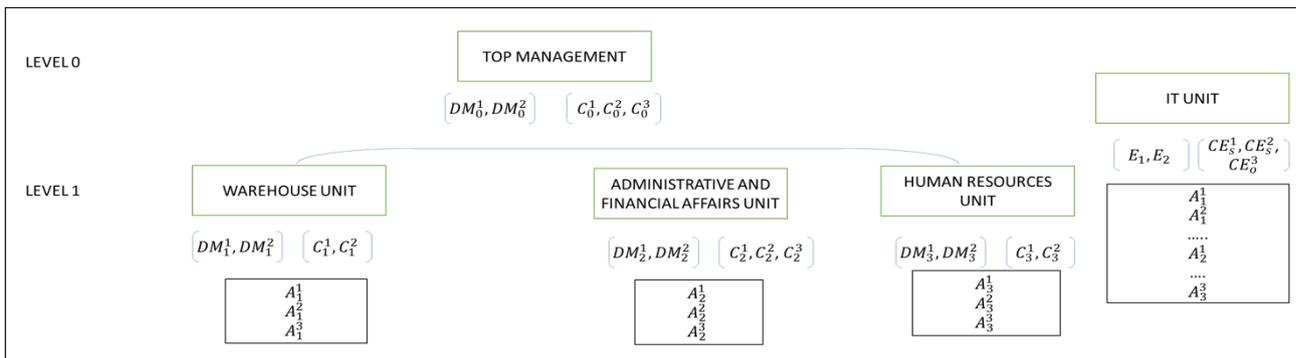
- Find the number of seats allocated to parties using Highest Average Method (d'Hondt's rule).
- What would be result in part a) if there were no 10% election threshold?
- Find the number of seats allocated to parties using Greatest Remainder Method. Consider there is 10% election threshold.
- What would be result in part c) if there were no 10% election threshold?
- Discuss the properties of Highest Average Method and Greatest Remainder Method based on the results.
- Discuss the effect of 10% election threshold on the results.

2. (30 points) ATK-Constrictions has operations in Turkey and other several countries. At the moment they are considering to expand their operations in Americas. They made an extensive feasibility analysis, financial plans etc. to make the decision. After considering all analysis, six officers of the company made a final meeting. They voted on expanding decision using 4 term scale: Strongly agree, Agree, Disagree, and Strongly disagree. Their importance and relevance to the decision are also evaluated. Please see the decision makers, their importance and relevance and their vote in the following table.

- Use the methodology proposed in Skoda et al. (2021) to make the final decision of expansion. Notice that while we were discussing the paper during the last week's presentation, we realized that the definitions of linguistic terms as triangular fuzzy number are not correct in the paper. Please apply the correct forms of triangular fuzzy numbers.
- Is the solution found in part a) robust enough to make the decision without any doubt?
- Propose a consensus measure for this problem and calculate consensus level for the given instance.

Decision Makers	Importance	Relevance	Vote
President	Very Important	Very relevant	Agree
Vice-President – Finance	Important	Moderately relevant	Strongly Agree
Vice-President – Operations	Important	Very relevant	Disagree
Vice-President – human resources	Important	Moderately relevant	Agree
Director – Country Operations	Moderately Important	Moderately Relevant	Strongly disagree
Director – Foreign operations	Slightly important	Relevant	Strongly Agree

3. (40 points) A company would like to evaluate project suggested by the employees. Hierarchical group decision making (HGDM) approach will be used for this purpose. The HGDM structure of a company is given in the following figure. This company has 3 units in the hierarchy such as warehouse unit, administrative and financial affairs unit and human resources unit. Each unit in the hierarchy has 3 projects to be evaluated and each of them has 2 DMs. Additionally, warehouse unit has 2 criteria, administrative and financial affairs unit has 3 criteria and human resources unit has 2 criteria. Top management is located on top of the hierarchy, which has 2 DMs and 3 criteria. There is an IT unit, located out of the hierarchy. The pairwise comparison matrices and the weights of criteria are given on the excel file attached to the exam. Please use the method proposed in Şahin Zorluoğlu and Kabak (2020) to rank the alternative projects.



References:

Škoda, M., Flegl, M., & Lozano, C. (2021). Fuzzy approach for group decision-making in crisis situations. *Business: Theory and Practice*, 22(1), 180-189.

Şahin Zorluoglu Ö, Kabak Ö. (2020) Hierarchical group decision-making approach for information technology project evaluation and prioritization. *J Multi-Crit Decis Anal.* (preprint) 1–20. <https://doi.org/10.1002/mcda.1723>