

GROUP DECISION MAKING UNDER MULTIPLE CRITERIA

FINAL EXAM – Take-home

Assoc. Prof. Özgür Kabak

June 16, 2020

Due date: June 26, 2020, 17:00

Please submit your files to ninova before 17:00 on June 26th 2020 (Friday).

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).

If necessary, announcements will be made on ninova “Duyurular”.

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 in your own computer. You may search on internet. 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 in question 2.
- You have to convert the word file or handwritten papers to a pdf file to upload on ninova.
- If you use excel in question 2, please prepare a single excel file. Each sub-question (a, b, c, d) should be in a separate sheet.
- Please upload your answers on ninova as **3 pdf files (one for each question)** and an excel file for question 2.

QUESTIONS

- 1) (35 points) Find 6 articles related to Large Scale Group Decision Making (LSGDM) in sciencedirect database (proceedings or book chapters are not accepted). Answer the following questions based on these articles.
 - a) Summarize the 6 articles and write the distinguishing properties and contributions of these articles to group decision making literature.
 - b) What are the general characteristics of LSGDM problems?
 - c) How can the methods for LSGDM problems be classified? Classify the 6 articles you have found.
 - d) How the consensus measures are used and developed for LSGDM problems? How the consensus measures for LSGDM are similar and dissimilar to the consensus measures for classical GDM.

Please list the articles in APA format. Do not forget to add the doi of the articles. Example:

Kabak, Ö., & Ervural, B. (2017). Multiple attribute group decision making: A generic conceptual framework and a classification scheme. *Knowledge-Based Systems*, 123, 13-30.
<https://doi.org/10.1016/j.knosys.2017.02.011>

- 2) (35 points) Consider the illustrative example given in Kutlu Gündoğdu and Kahraman (2019). It is a supplier selection problem with four alternatives (X1, X2, X3, X4), four criteria (C1, C2, C3, C4). Three decision makers provide evaluations in Table 3, Table 4, and Table 5. Importance weights of criteria are given in Table 8. The weights of the DMs are 0.3, 0.2, and 0.5, respectively. The aim is to rank the suppliers based on given information.
- Solve the given problem by the GDM methodology proposed in Çalı and Balaban (2019). If required, make necessary assumptions and explain them in your answer.
 - Solve the given problem using Cumulative Belief Degrees approach (Ervural and Kabak, 2019). If required, make necessary assumptions and explain them in your answer.
 - Use another appropriate approach that was covered during class to solve the given problem. Initially, explain the reasons of selecting the approach. Then, write the steps of the approach. Finally apply the approach and find results. If required, make necessary assumptions and explain them in your answer.
 - Compare the results you find in parts a, b, c and the results of Kutlu Gündoğdu and Kahraman (2019). Discuss the properties of the four approaches based on the results.
- 3) (30 Points) According to Endriss (2011), social choice theory can be applied in e-commerce. Identify 3 specific areas where social choice theory can be applied in e-commerce. Explain how social choice theory can be applied in these areas. Suggest at least two voting methods or social choice functions to approach each of the areas. Explain the reasons of selecting these methods.

References:

- Kutlu Gündoğdu, F., & Kahraman, C. (2019). Spherical fuzzy sets and spherical fuzzy TOPSIS method. *Journal of Intelligent & Fuzzy Systems*, 36(1), 337-352. <https://doi.org/10.3233/JIFS-181401>
- Çalı, S., & Balaban, Ş. Y. (2019). A novel outranking based multi criteria group decision making methodology integrating ELECTRE and VIKOR under intuitionistic fuzzy environment. *Expert Systems with Applications*, 119, 36-50. <https://doi.org/10.1016/j.eswa.2018.10.039>
- Ervural, B., & Kabak, Ö. (2019). A cumulative belief degree approach for group decision-making problems with heterogeneous information. *Expert Systems*, <https://doi.org/10.1111/exsy.12458>
- Endriss, U. (2011). Computational social choice: Prospects and challenges. *Procedia Computer Science*, 7, 68-72. <https://doi.org/10.1016/j.procs.2011.12.022>