Name, student id ...................................................................................

Points, grade .......... of 6 points      **grade**:

**Exercise 1.** Assume that you are negotiating with your friends on your holiday. The table below shows the negotiation issues and their possible values.

| Issue | Possible values |
|---|---|
| Location | Antalya, Barcelona, Milan |
| Duration | one week, two weeks |
| Hotel Quality | Hostel, 3 star hotel, 5 star hotel |

Agent A's preferences:

| |
|---|
| Wlocation= 0.6 Wduration= 0.3 Whotel-quality=0.1 |
| Evaluation values: 1, 0.6, 0.1 for Antalya, Barcelona and Milan respectively |
| Evaluation values: 0.3, 1 for one week and two weeks respectively |
| Evaluation values: 0.2, 0.5, 1 for hostel, 3 star hotel and 5 star hotel respectively |

The monotonic concession strategy offers bids from high utility to low utility, starting with the highest possible utility. Assume Agent A employs a monotonic concession strategy. These are the first 5 offers:

| | | | |
|---|---|---|---|
| 1 | Antalya | two weeks | 5 star |
| 2 | Antalya | two weeks | 3 star |
| 3 | Antalya | two weeks | hostel |
| 4 | Antalya | one week | 5 star |
| 5 | Barcelona | two weeks | 5 star |

1. What is Agent A's sixth offer?
   A [Antalya, one week, 3 star]
   B [Antalya, two weeks, 3 star]
   C [Milan, two weeks, hostel]
   D [Milan, one week, 5 star]
   E [Milan, two weeks, 5 star]

2. What is Agent A's utility of the fourth offer?
   A) 0
   B) 0.74
   C) 0.76
   D) 0.79
   E) 1

3. If agent B knows agent A is using a monotonic concession strategy, would it be an optimal strategy for Agent B to just keep offering it's optimal bid?

   A) Yes, always
   B) Only if agent B knows that agent A does not have a reservation value
   C) Only if agent B knows that the deadline allows for at least 18 bids
   D) Only if both B and C are the case
   E) Never

IN4085 pattern Recognition 6
CS4010 Algorithm for Planning and Scheduling 5
IN4010-12 Artificial Intelligence Techniques 6
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IN4309 Multivariate Data Analysis 5
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## Part II

Agent B would like to model its opponent's preferences (Agent A's preferences) by employing "frequency analysis". Calculate the estimated preference profile (weights and evaluation values) after receiving Agent A's first five offers. Please take n = 0.1 in your estimation and only normalize at the end.

4. According to the estimated preference profile of agent A, what are the normalized evaluation values for Antalya, Barcelona and Milan?

    A)  1/3    1/3    1/3
    B)  1      1      1
    C)  1      1/5    0
    D)  1      1/4    0
    E)  4/5    1/5    0

5. According to the estimated preference profile of agent A, what are the normalized issue weights for Location, Duration and Quality after the 5 bids? (rounded to 2 decimal places)

    A)  0,33    0,33    0,33
    B)  0,33    0,50    0,33
    C)  0,39    0,43    0,18
    D)  0,43    0,37    0,20
    E)  0,60    0,30    0,10

## Part III

Agent B would like to employ a trade-off strategy. Suppose that it wants to send out an offer of 0.6. The iso-curve of all bids with utility 0.6 of agent B are as follows:

(Barcelona, 2 weeks, hostel), (Antalya, 1 week, 3 star hotel), (Milan, 1 week, 5 stars), (Antalya, 1 week, hostel), (Milan, 2 weeks, 3 star hotel)

We want to use Hamming distance to find the most similar bids. Hamming distance is the sum of the hamming distance of the values. According to the hamming distance of values, if two values are the same, then the distance is equal to zero; otherwise it is one. For example, for (x1,y2, z3) and (x2, y2, z1), the overall hamming distance will be 2.

6. Which offer should Agent B propose to Agent A after receiving Agent A's second offer? (At round 2). Please use hamming distance in your similarity estimation. If there is more than one possible offer, please note all of them in your answers.

    A) [Barcelona, 2 weeks, hostel]
    B) [Antalya, 1 week, 3 star hotel]
    C) [Milan, 2 weeks, 3 star hotel]
    D) Both A and B are correct
    E) Both B and C are correct

7. Assume that for the first 3 bids agent B uses this trade-off strategy, and agent A accepts the third bid. Also assume that this third bid has a higher utility for A than the first two bids. How can this bid be classified?

    A) Concession
    B) Unfortunate
    C) Fortunate
    D) Selfish
    E) Nice

**Solution:**  1A 2B 3D 4D 5D 6E 7E

▲