TEST Decision Sciences	**VERSION 1**
Academic Year 2007-2008	Total Time : 150 mins
Name Student : ……	SCORE : ……. / 20

QUESTION 1	TIME : 20 mins
Case CORN TRADING	SCORE : …… / 4

In the sensitivity analysis for the case Corn Trading, we see the following :

The shadow cost for the capacity constraint on the maximum inventory capacity for month 1 has a value of 9,8 (+/- a rounding error).

Explain what this means with simple logic (i.e. without advanced calculations) and explain the value of 9.8.

The value of 9,8 shows that an expansion of the inventory capacity with “1 unit” in month 1, would generate a potential extra 9,8 EUR in profit.
Have one extra unit of inventory capacity available in period 1, allows for the purchase of one extra unit and to sell that unit in the second period with a gross margin of 10 EUR. From that 10 EUR, the inventory carrying cost (5 promille on the purchasing cost of 40 EUR, equals 0,2 EUR) has to be subtracted leading to a potential 9,8 EUR in profit.

QUESTION 2	TIME : 30 mins
SIMULATION	SCORE : ……. / 4

The weekly demand (D) for soda drinks depends on the outside temperature (T) in the following way : D = 200 + 2 x (T – 10)

Historical statistics show the following probability for a given temperature in week 25 (in the right hand column, you'll find the cumulative distribution) :

Between 0° and 5° Celsius :	0.05	0,05
Between 5° and 10° Celsius :	0.23	0,28
Between 10° and 15° Celsius :	0.28	0,56
Between 15° and 20° Celsius :	0.24	0,80
Between 20° and 25° Celsius :	0.15	0,95
Between 25° and 30° Celsius :	0.05	

Calculate the average demand for week 25 using 6 replications and using the following random numbers :

1	**0.61**	*6*	**0.17**
2	**0.27**	*7*	**0.68**
3	**0.99**	*8*	**0.55**
4	**0.43**	*9*	**0.69**
5	**0.60**	*10*	**0.87**

Additional Notes :

- For every given temperature interval, you can use the lower boundary of the interval for your calculation, e.g. if the simulation shows that the temperature is between 5° and 10° Celsius, you can use the value 5 for the purpose of your calaculation of the weekly demand.
- Use the stream of random values in the table in the sequence as indicated by the sequence numbers (i.e. first the left hand column, then the right hand column).

Replication 1 : 0.61	15 °	210
Replication 2 : 0.27	5 °	190
Replication 3 : 0.99	25 °	230
Replication 4 : 0.43	10 °	200
Replication 5 : 0.60	15 °	210
Replication 6 : 0.17	5 °	190

Average = 205

QUESTION 3	TIME : 45 min
DECISION TREES	SCORE : ……. / 6

CULTURE CITY.

1. First assume that the following option is added to the case : in addition to sending the coordinator to the seminar, you could also hire a market research agency to ask the neighboring cities for their intentions to build sports accommodations as well, in case of success of our sports accommodations. (i.e. the same question as the one answered by the coordinator by going to the seminar).
You have these two options (coordinator to seminar and/or market research agency) at the same time and independent from each other and you can choose to do either one or both.
Draw the structure of the decision tree that you would use to analyze and solve this problem. You DO NOT have to solve the tree; you only have to draw the structure graphically.

2. Back to the original case now (i.e. the only possibility to obtain information on the intention of the neighboring cities is by sending the coordinator to the seminar). Assume now that you could use the same market research agency to estimate the probability of success by sending out a questionnaire to the people living in your city. You still can send the coordinator to the seminar (independent from your decision to use the market research agency and both can be done together, however both have obviously a different objective).

Draw again the structure of the decision tree but also fill out the probabilities that are attached to each of the events. Do not forget to clearly mention your assumptions or criteria that have been used in calculating/estimating these probabilities.

QUESTION 4	TIME : 25 mins
Terminology	SCORE : ……. / 6

Exponential Smoothing

Is a forecasting technique that creates a forecast based on extrapolation of a historical time series. Alle historical values in the time series are included however, the most recent values receive a much higher weight than the older ones (exponential smoothing of these weights). The parameter alpha determines the weight of the most recent historical value.

Simplex

Is an algorithm used in linear programming to calculate all the corner points within the solution space. A corner point is defined as a crossing point of constraints. The optimal solution of a linear programming problem is always located in one of these corner points (or in more than one, in case of a degenerate problem).

Box Jenkins

Is an advanced forecasting technique that decomposes (using an iterative algorithm) a historical time series in several predefined components and (remaining) white noise. For each of these components, an appropriate forecasting approach is used for extrapolation.

Mean Absolute Deviation (MAD)

Is a measure for the accuracy of a forecast. This measure takes the absolute value of a number of consecutive (over time) forecasting errors and takes the average of that.

Branch-and-Bound technique

Is a technique used in mixed integer linear programming.

Starting from a linear programming problem with (one or more) integer variables, this technique creates several linear subproblems that can be solved with normal simplex. This procedure is continued until all options (branches) in the MILP are explored or until the best potential solution in each branch is worse that a solution that has already been found (pruning).

Laplace's Criterion

Is a heuristic in decision tree optimization that allocates an equal probability to each event in an event node.