Decision Analysis
Homework #6

Question 1

Find the best 3-branch discrete distribution that best represents the following distributions. You may use DPL software to check your answers.

(*a*) A normal distribution with *mean* = 10 and *standard deviation* = 4

(*b*) A uniform distribution with *min*=10, *max*=15.

(*c*) A triangular distribution with *min*=20, *max* =30, *mode*=27.5.

Question 2

Your department wants to purchase a new personal computer. Three criteria are important in determining which computer should be purchased: Cost, User-friendliness, and Software availability. The pairwise comparison matrix for these criteria is as follows:

	Cost	User-friendliness	Software availability
Cost	1	1/4	1/5
User-friendliness		1	1/2
Software availability			1

Three computers are being considered for purchase. The performance of each computer with regard to each criterion is indicated by the following pairwise comparison matrices.

Criterion Cost:

	Computer 1	Computer 2	Computer 3
Computer 1	1	3	5
Computer 2		1	2
Computer 3			1

Criterion User-friendliness:

	Computer 1	Computer 2	Computer 3
Computer 1	1	1/3	1/2
Computer 2		1	5
Computer 3			1

Criterion Software availability:

	Computer 1	Computer 2	Computer 3
Computer 1	1	1/3	1/7
Computer 2		1	1/5
Computer 3			1

(*a*) If the AHP method is followed, which computer should be purchased?

(*b*) Check the consistency of the pairwise matrices.

Question 3

A field hospital set up for a relief operation in a remote area must determine at the beginning of each week how many pints of blood should be ordered from its home base. Any blood left over at the end of the week will be outdated and cannot be used. The field hospital considers the following two attributes of be important:

1. *Weekly blood shortage* (x_1): This is the number of pints of blood by which ordered blood falls short of the week's demand. This quantity is known to be always between 0 and 10 pints.

2. *Weekly blood outdated* (x_2): This is the number of pints of blood that are outdated. This quantity is known to be always between 0 and 10 pints.

The hospital's utility function is $u(x_1, x_2) = 0.4\,u_1(x_1) + 0.5\,u_2(x_2) + 0.1\,u_1(x_1)\,u_2(x_2)$

where $u_1(x_1) = 0.582\left[\exp(1 - \frac{x_1}{10}) - 1\right]$ and $u_2(x_2) = 1 - \frac{x_2^2}{100}$.

Suppose that each week there is a 0.5 chance that the demand for blood will be 25 pints and a 0.5 chance it will be 35 pints. Would the blood bank be better off ordering 28 pints, 30 pints, or 32 pints?