Exercise.

The router is a microelectronic device which has to be used in each computer network to provide the link from one network to another. It enables the information (packets) to be transmitted from the source of information to the required destination. There are a number of different routers available on the market. They have different characteristics and different prices. We shall consider 8 routers. The analysis made suggests that 6 criteria have to be taken into account including price, warranty, number of local area network (LAN) interfaces, number of wide area network (WAN) interfaces, forwarding rate, filtering rate. The values of criteria are given in a table.

	Price ($)	**Warranty (Days)**	**Number of LAN interfaces**	**Number of WAN interfaces**	**Forwarding rate (number of million of packets per second)**	**Filtering rate (number of million of packets per second)**
Enterprise router	13000	365	60	60	300	250
Access Stock Node	4000	90	24	24	200	200
Backbone Node	12000	90	52	52	100	100
LAN2LAN Enterprise	2490	365	4	24	15	30
XL80 High End Backbone Router	16100	90	32	48	280	148
IEN 500	7000	365	8	8	190	148
CNX 600	16150	365	20	20	50	50
Net Builder II	2995	365	8	8	50	35
Relative weights	3	1	1	1	3	3

Criteria considered and their types are described as follows:

Price (minimisation). We are indifferent if the difference between 2 router prices is less than or equal to $500. The preference is linearly increasing for the cheaper router when the difference of 2 router prices being between $500 and $12500. We strictly prefer one router to another if it costs at least $125000 less.

Warranty period (maximisation). It has only two values, and there is strict preference for greater warranty period.

Number of LAN interfaces (maximisation). The preference linearly increases for a greater number of LAN interfaces. We strictly prefer one router to another if it has more than 56 LAN interfaces.

Number of WAN interfaces (maximisation). In a similar way to the previous criterion the preference linearly increases for a greater number of WAN interfaces. We strictly prefer one router to another if it has more than 52 WAN interfaces.

Forwarding rate (maximisation). The number of packets that enter the network is random by nature. Therefore we give preference to the higher forwarding rate as it is given by the Gauss curve. The parameter s=50 is selected in such a way that Gauss curve has sufficiently steep ascent from 0 to 1.

Filtering rate (maximisation). In a similar way to the previous criterion the Gauss curve is used to present the preference with parameter s=50.

The weights of the attributes are W=(3, 1, 1, 1, 3, 3).

Present the following results:

a) The chosen generalised criteria and the values of parameters.

b) The value of preference indices for all pairs of alternatives.

c) The positive, negative and net outranking flow for each alternative.

d) The complete rank of alternatives (Promethee II).

Answer 2.

a)

	Price ($)	**Warranty (Days)**	**Number of LAN interfaces**	**Number of WAN interfaces**	**Forwarding rate (number of million of packets per second)**	**Filtering rate (number of million of packets per second)**
Type of criterion. (Types are explained in the lecture slides)	5	1	3	3	6	6
	q=500 p=12.50	-	p=56	p=52	s=50	s=50

b)

	A_1	A_2	A_3	A_4	A_5	A_6	A_7	A_8
A_1	-	0.509	0.605	0.641	0.436	0.607	0.686	0.661
A_2	0.177	-	0.589	0.529	0.346	0.211	0.757	0.546
A_3	0.010	0.087	-	0.464	0.111	0.136	0.379	0.377
A_4	0.209	0.104	0.271	-	0.333	0.109	0.256	0.026
A_5	0	0.231	0.342	0.565	-	0.3	0.526	0.58
A_6	0.115	0.083	0.470	0.490	0.262	-	0.646	0.476
A_7	0	0.083	0.083	0.097	0.083	0.037	-	0.048
A_8	0.198	0.094	0.261	0.062	0.333	0.073	0.250	-

c)

	ϕ^+	ϕ^-	ϕ
A_1	0.592	0.101	0.491
A_2	0.451	0.170	0.280
A_3	0.223	0.374	-0.151
A_4	0.187	0.407	-0.220
A_5	0.363	0.272	0.091
A_6	0.363	0.211	0.153
A_7	0.692	0.500	-0.438
A_8	0.181	0.388	-0.206

d)

Rank:

A_1, A_2, A_6, A_5, A_3, A_8, A_4, A_7