**Answer to question 1 [20 marks]**

**Problem description [15 marks]**

The description of the mixed-integer linear problem should include a nomenclature and the mathematical formulation of the problem, in order to obtain full marks. The nomenclature should describe in detail the symbols used in the problem formulation.

Nomenclature:

*Indices:*

*Parameters:*

big-M

*Variables:*

*# Is buying or selling*

Binary valuable, 0 if didn’t buy electric at each time t, 1 otherwise.

Binary valuable, 0 if didn’t sell electric at each time t, 1 otherwise.

Binary valuable, use to set constraint between VisBuy[t] and VisSell[t] at each time t.

*# How much to buying or selling*

use to set constraint between VisBuy[t] and . (kW)

use to set constraint between VisSell[t] and . (kW)

How much electric actually buy at each time t. (kW)

How much electric actually sell at each time t. (kW)

How much electric the car has at each time t. (kWh)

How much electric the solar generate at each time t. (kWh)

*# Is charging or discharging*

Binary valuable, 0 if didn’t charge at each time ev, 1 otherwise.

Binary valuable, 0 if charge at each time ev, 1 otherwise.

Binary valuable, use to set constraint between [ev] and [ev] at each time ev.

*# How much to charging or discharging*

use to set constraint between [t] and . (kW)

use to set constraint between [t] and . (kW)

How much electric actually charge into car at each time t. (kW)

How much electric actually discharge from car at each time t. (kW)

Problem formulation:

**Report results [5 marks]**

Electricity cost of the house ($): 8.2

Electricity bought (kWh): 53

Electricity sold (kWh): 0

**Answer to question 2 [15 marks]**

**Problem description [10 marks]**

The description of the mixed-integer linear problem should include a nomenclature and the mathematical formulation of the problem, in order to obtain full marks. The nomenclature should present only the new symbols not described in question 1.

Nomenclature:

*Indices:*

Other indices remain same as question 1, except:

*Parameters:*

Parameters remain same as question 1.

*Variables:*

Other variables remain same as question 1, except:

Binary valuable, 1 if the time t and t-1 and t+1 are selected as operation hours.

Binary valuable, 1 present the time t selected at .

Binary valuable, 1 present the time t + 1 selected at

Binary valuable, 1 present the time t - 1 selected at

combination of

Problem formulation:

Problem formulation is basically same as question 1, anything new will be coloured.

**Report results [5 marks]**

Electricity cost of the house ($): 8.5

Scheduling of the new appliance:

|  |  |  |  |
| --- | --- | --- | --- |
| Hours | 3 | 4 | 5 |

**Answer to question 3 [20 marks]**

**Problem description [15 marks]**

The description of the mixed-integer linear problem should include a nomenclature and the mathematical formulation of the problem, in order to obtain full marks. The nomenclature should present only the new symbols not described in question 1.

Nomenclature:

*Indices:*

Other indices remain same as question 1, except:

*Parameters:*

Other parameters remain same as question 1, except:

()

*Variables:*

Other variables remain same as question 1, except:

The biggest number amount . (kW)

The biggest number amount . (kW)

The biggest number amount . (kW)

The smallest number that greater than 4. (kW)

The smallest number that greater than 8. (kW)

The biggest number that greater than 8. (kW)

. (kW)

0.5 or 1 or 1.5. ($)

,

Binary valuable,

Problem formulation:

**Report results [5 marks]**

Electricity cost of the house ($): 8.7

Electricity network fee ($): 0.5