

**Exercise 9**

(i)

$$bs_I^{add}(at - pigeon = L_2) = move(L_1, L_2)$$

$$bs_I^{add}(at - pigeon = L_3) = move(L_2, L_3)$$

$$bs_I^{add}(mes - found = true) = take - mes$$

$$bs_I^{add}(mes - sent = true) = send - mes$$

(ii)

$$Open := \{mes - sent = true\}$$

Iteration 1:

$$select\ g := mes - sent = true$$

$$Open := Open \setminus g$$

$$RPlan := RPlan \cup \{send - mes\}$$

$$Open := Open \cup \{at - pigeon = L_3, mes - found = true\}$$

Iteration 2:

$$select\ g := at - pigeon = L_3$$

$$Open := Open \setminus g$$

$$RPlan := RPlan \cup \{move(L_2, L_3)\}$$

$$Open := Open \cup \{at - pigeon = L_2\}$$

Iteration 3:

$$select\ g := mes - found = true$$

$$Open := Open \setminus g$$

$$RPlan := RPlan \cup \{take - mes\}$$

$$Open := Open \cup \{\} // \text{opens nothing}$$

Iteration 4:

$$select\ g := at - pigeon = L_2$$

$$Open := Open \setminus g$$

$$RPlan := RPlan \cup \{move(L_1, L_2)\}$$

$$Open := Open \cup \{\} // \text{opens nothing}$$

$$RPlan = \{send - mes, move(L_2, L_3), take - mes, move(L_1, L_2)\}$$

$$h^{FF}(I) = 4$$

(iii)

The actions from  $RPlan$  can be ordered to an optimal delete-relaxed plan for the initial state. To begin with,  $at - pigeon = L_1$ , and  $move(L_1, L_2)$  adds  $at - pigeon = L_2$ . Then,  $move(L_2, L_3)$  adds  $at - pigeon = L_3$ .  $take - mes$  adds  $mes - found = true$ , and finally,  $send - mes$  adds  $mes - sent = true$ .