EEE 587 Optimal Control – HW 1

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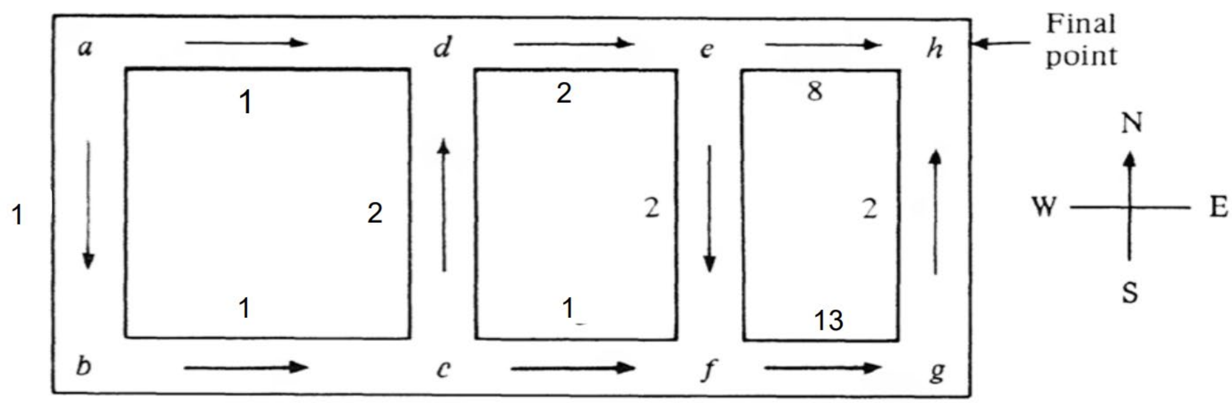


Question 1. Forward Enumeration

1. Route 1 – a – d – e – h

   Cost – 1 + 2 + 8 = 11

   Optimal Route – E – E – E

2. Route 2 – a – b – c – f – g – h

   Cost – 1 + 1 + 1 + 13 + 2= 18

   Optimal Route – S – E – E – E – N

3. Route 3 – a – d – e – f – g – h

   Cost – 1 + 2 + 2 + 13 + 2 = 20

   Optimal Route – E – E – S – E – N

4. Route 4 – a – b – c – d – e – h

   Cost – 1 + 1 + 2 + 2 + 8 = 14

   Optimal Route – S – E – N – E – E

5. Route 5 – a – b – c – d – e – f – g – h

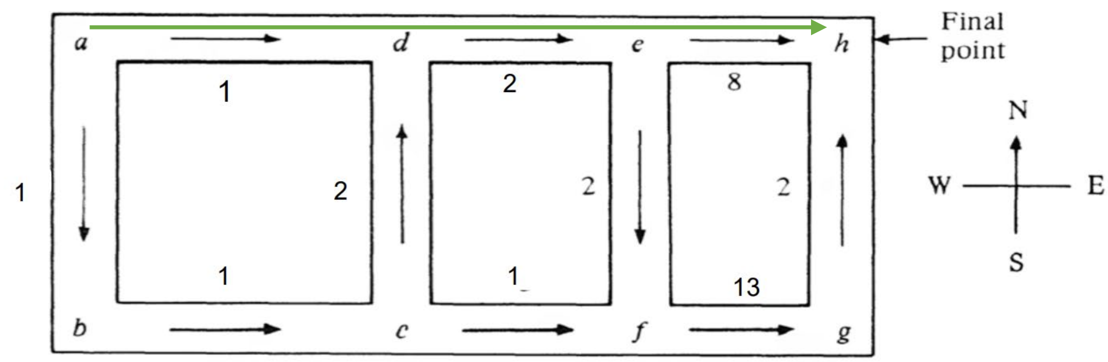
   Cost – 1 + 1 + 2 + 2 + 2 + 13 + 2 = 23

   Optimal Route – S – E – N – E – S – E – N

Based on the minimum cost – Route 1 is selected with the cost of 11 (highlighted in green)

Route 1 – a – d – e – h

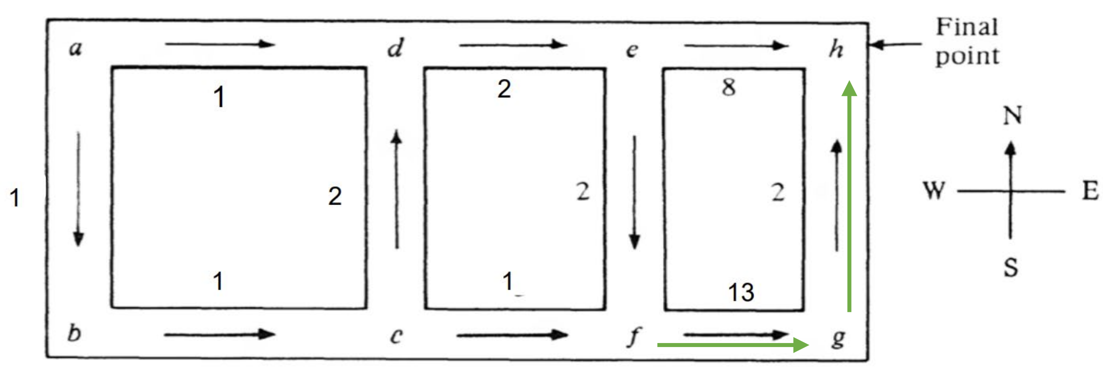
Optimal Route is therefore – E – E – E



Question 2. Principal of Optimality

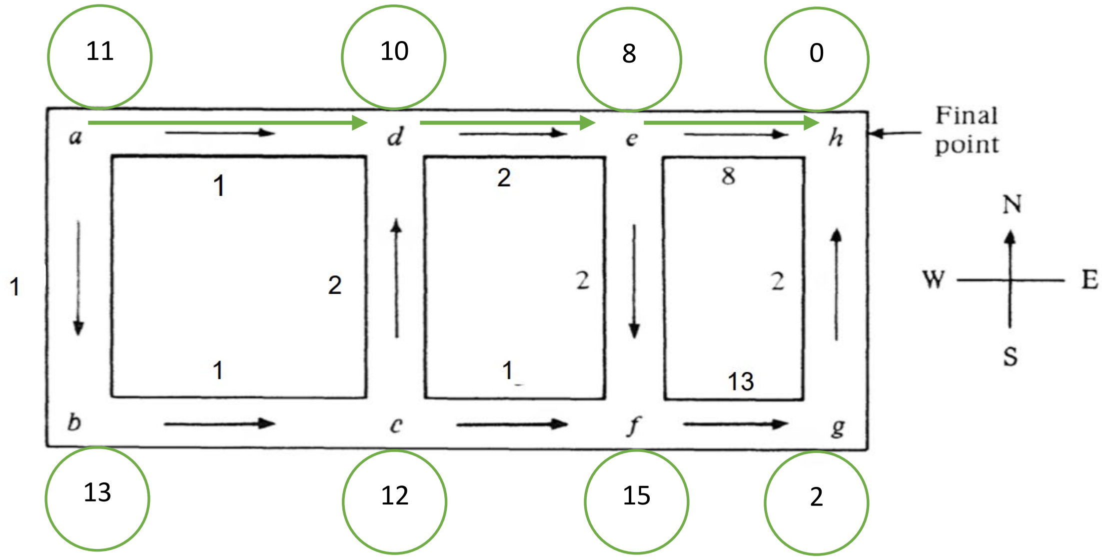
Applying the principal of optimalitym we start from the last state g and move backwards to the initial state a. In each state, the most optimal path is selected.

Current Intersection	Heading	Next Intersection	Min. cost to reach from a to h via xi	Min. cost to reach from a to h	Optimal Heading
g	N	h	2 + 0 = 2	2	N
f	E	g	13 + 2 = 15	15	E
e	E	h	8 + 0 = 8	8	E
	S	f	2 + 15 = 17		
d	E	e	2 + 8 = 10	10	E
c	N	d	2 + 10 = 12	12	N
	E	f	1 + 15 = 16		
b	E	c	1 + 12 = 13	13	E
a	E	d	1 + 10 = 11	11	E
	S	b	1 + 13 = 14		



As it can be seen, there is no optimal route if we start from G

Optimal path when we start from E



Optimal Route using Principal of Optimality – a – d – e – h (highlighted in green)

Route – E – E – E

Therefore the optimal action at state a is East which will take it to state d, then again East to take it to state e and finally East to take it to the destination h.

Hence total cost is 11.

Which is the same as the route found using forward enumeration.