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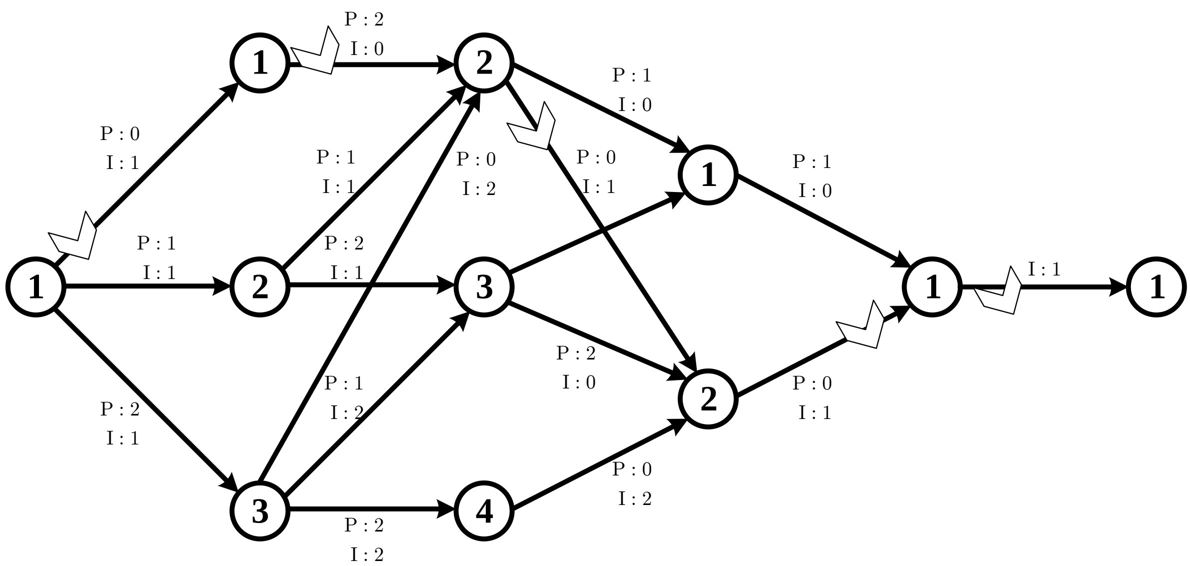
1. A company that makes airplanes has one of them on hand at the beginning of the current month. Orders for this month and for next three months are $1; 2; 1; 0$ airplanes, respectively. The company wants to have one airplane on hand at the beginning or the fifth month, which means that a total of 4 airplanes must be manufactured over the next 4 months. Orders for a particular month may be filled from that months production or from inventory. The problem is to find a production schedule that satisfies demand and minimizes the total cost of producing $0, 1$ or 2 airplanes in a give month is $10, 17$ and 20, respectively. The cost of having $0, 1$ or 2 airplanes in inventory at the start of a month is $0, 3$ and 7, respectively.
   (a) Draw a network whose shortest path is the best production schedule.
   (b) Find the best production schedule by backward induction.

We know that:

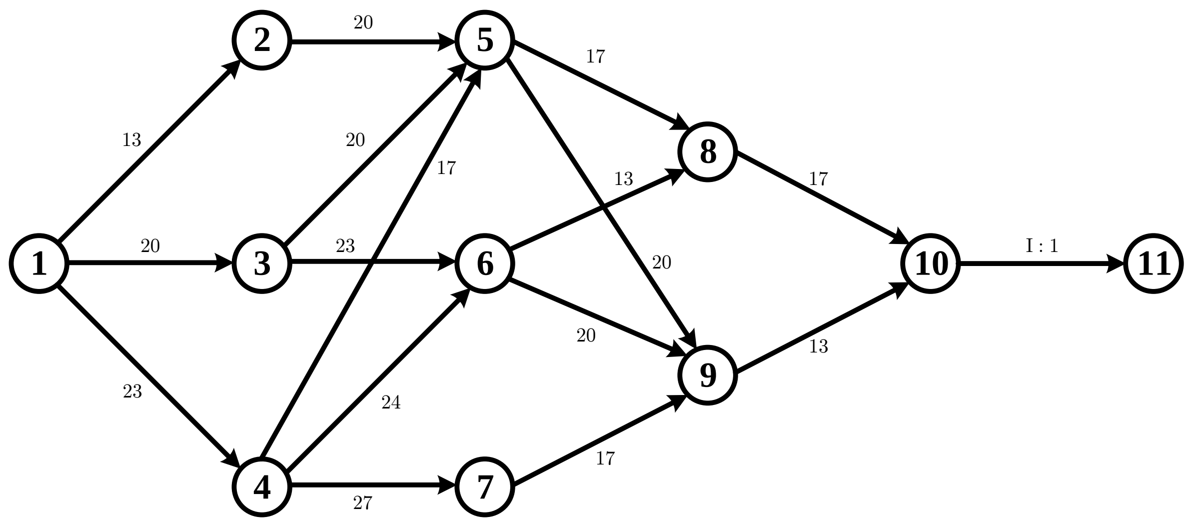
Month	0	1	2	3	4
Demand	1	2	1	0	1

Number of Airplane	0	1	2
Cost	10	17	20
Inventory Cost	0	3	7

(a)



Note that the number in each circles means the number of airplanes in each nodes.



Note that the number in each circles means the plan for production.

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(b) By the backward induction method:

$$f_{11} = 0,\ f_{12} = 3$$

$$f_8 = 20,\ f_9 = 16$$

$$f_5 = \min\{17+20, 20+16\} = 36,\ f_6 = \min\{13+20, 20+16\} = 33,\ f_7 = 17+16 = 33$$

$$f_2 = 20+36 = 56,\ f_3 = \min\{20+36, 23+33\} = 56,\ f_4 = \min\{17+36, 24+33, 27+33\} = 53$$

$$f_1 = \min\{13+56, 20+56, 23+56\} = 69$$

We can know that the **BEST PLAN SCHEDULE** would be

① → ② → ⑤ → ⑨ → ⑩ → ⑪

Then

Month	0	1	2	3	4
Number of Production	0	2	2	0	0

And the total cost would be 69