MATH3202/7232 Operations Research & Mathematical Planning 2017

Week 5 – Factory Planning

An engineering factory makes seven products on the following machines: four grinders, two vertical drills, three horizontal drills, one borer and one planer. Each product yields a per unit profit and has a required per unit production time (in hours) on each of the machines, as given in the following tables (a dash indicates a product does not require that process):

Product	Grinding	VDrilling	HDrilling	Boring	Planing	Profit
1	0.5	0.1	0.2	0.05	-	$10
2	0.7	0.2	-	0.03	-	$6
3	-	-	0.8	-	0.01	$8
4	-	0.3	-	0.07	-	$4
5	0.3	-	-	0.1	0.05	$11
6	0.2	0.6	-	-	-	$9
7	0.5	-	0.6	0.08	0.05	$3

Over the production horizon certain machines will be down for maintenance as follows:

January	1 grinder
February	2 horizontal drills
March	1 borer
April	1 vertical drill
May	1 grinder and 1 vertical drill
June	1 planer and 1 horizontal drill

There are marketing limitations on each product in each month as follows:

Product	Jan	Feb	Mar	Apr	May	Jun
1	500	600	300	200	0	500
2	1000	500	600	300	100	500
3	300	200	0	400	500	100
4	300	0	0	500	100	300
5	800	400	500	200	1000	1100
6	200	300	400	0	300	500
7	100	150	100	100	0	60

It is possible to store up to 100 of each product at a time at a cost of $0.5 per unit per month. There are no starting stocks, but it is desired to have 50 units of each product in stock at the end of June.

We can assume the factory works 16 hours a day for 24 days a month and that there are no sequencing problems.

Question 1

When and what should the factory make in order to maximise the total profit?

Question 2

Instead of the fixed maintenance schedule given, suppose you can choose which months the machines are to be maintained. Adjust your model to calculate the optimal maintenance schedule.