Project Scheduling

A construction contractor is responsible for a project with seven key tasks. Some of the tasks can begin at any time, but others have predecessor tasks that must be completed previously. The individual tasks can be carried out at standard times or they can be expedited ("crashed"). The cost of executing the task increases by a certain cost per day if its time is shortened. The following table shows the information describing the tasks of the project, their standard and minimum times (in days), their standard costs, the crashing cost per day shortened, and the predecessor(s):

Task Number	Minimum Time	Standard Time	Standard Cost	Cost/ Day to Shorten	Predecessor Tasks
1	6	12	1,600	100	None
2	8	16	2,400	75	None
3	16	24	2,900	120	2
4	14	20	1,900	100	1, 2
5	14	16	3,800	140	3
6	12	16	2,900	165	3
7	2	12	1,300	60	4

The project has a deadline of 40 days, which the contractor is committed to meet.
a. If no crashing is done, how long will the project take and what will be its cost?
b. Which activities should be crashed to achieve the least-cost schedule that meets a 40-day deadline? What is the difference between its cost and the cost in part (a)?

Source of this problem: Question 13 of Chapter 9 "Linear Optimization" of book ``Business Analytics: The Art of Modeling with Spreadsheets", by Stephen G. Powell and Kenneth R. Baker, 5 th Edition, 2017, John Wiley and Sons.