10.5. Problems on dynamic optimization for lectures 9 and 10

Problem 9.1. Using the Bellman's optimality principle find the maximum and minimum profits of the process in fig. 1. The numbers of nodes are in the rectangles and the weights are bold.

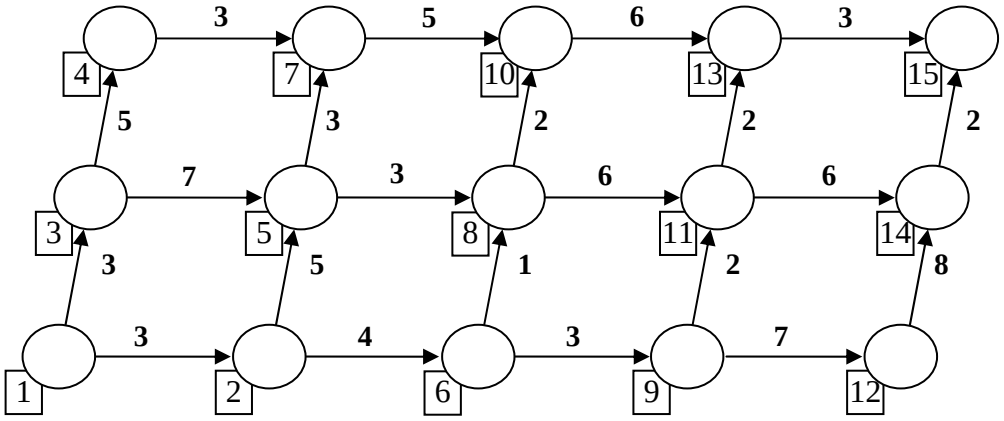

Fig. 1. Oriented weighted graph for problem 9.1.

Problem 9.2. Solve the problem for a maximum distribution of a one-dimensional resource using the data

Sectors \ Units	0	1	2	3	4	5
$g_1(x_1)$	0	10	15	25	20	60
$g_2(x_2)$	0	15	20	30	45	60
$g_3(x_3)$	0	20	30	40	50	60

Answer: The maximal price is 65. Three solutions: (0,4,1),(1,1,3) and (0,1,4).

Problem 10.1. For the graph in fig. 2 write: a) a representation using an incidence list; b) an incidence matrix; c) a distances matrix.

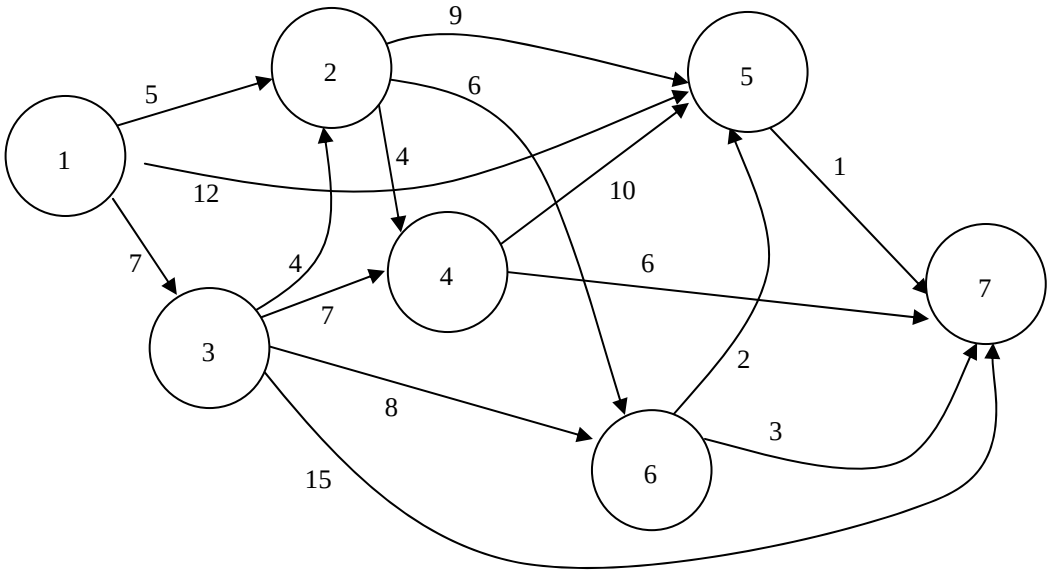

Fig. 2.

Problem 10.2. Find the shortest path itinerary from node 1 to node 4 for the graph in fig. 3.

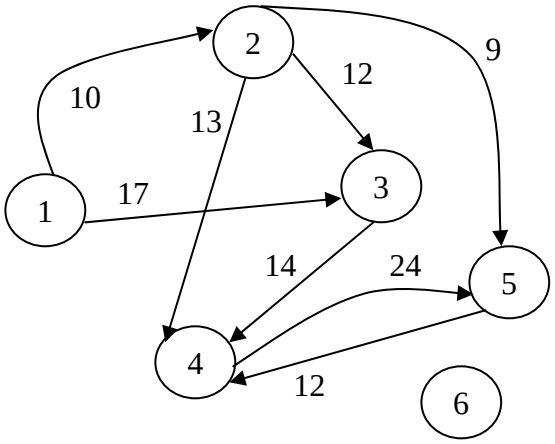

Fig. 3. Oriented weighted grapf.

Problem 10.3. Find the shortest paths from node 1 to all other nodes from the graph in fig. 2: a) using Bellman-Ford's algorithm; b) using Dijkstra's algorithm.

Problem 10.4. Solve example 10.3 using Dijkstra's algorithm.

Problem 10.5. For the graph in fig. 7: a) compile a distances matrix; b) use Bellman-Ford's algorithm to find the minimal distances from node 1 to all other nodes; c) solve the variant in which the distance between node 3 and 5 is -3; d) what's the number of contours of the graph?

Problem 10.6. For the graph in fig. 4: a) use Dijkstra's algorithm to find the shortest path itineraries from node 1 to all other nodes; b) find the shortest path itinerary from node 3 to node 1.

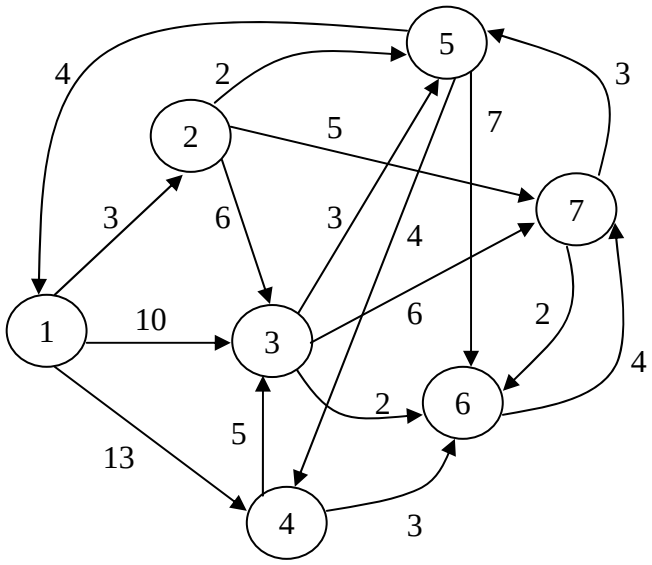

Fig. 4. Graph with multiple contours.

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