MTH6105 – Algorithmic Graph Theory

Problem Sheet 7

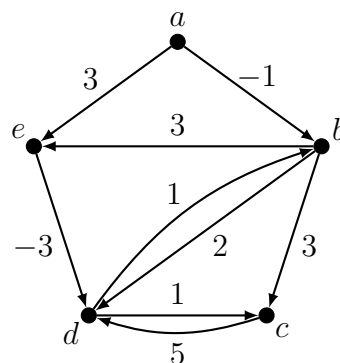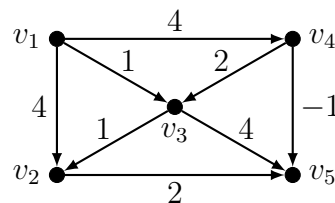**Spring 2024**

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You are expected to **attempt all exercises** before the seminar and to **actively participate** in the seminar itself.

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1. Use the Bellman-Ford algorithm to find a shortest directed $a-c$-path in the following directed network.

2. Consider the following directed acyclic network.

   (a) Use Morávek's algorithm to find a longest directed v_1-v_5-path in the network.

   (b) Adapt Morávek's algorithm to find a shortest directed v_1-v_5-path in the network.

3. Consider the following activities involved in the construction of a garage:

	activity	duration (days)	must follow
a	prepare foundations	7	
b	make door frame	2	
c	lay drains, floor base, and screed	15	
d	install services and fittings	8	e
e	erect walls	10	a, b
f	plaster ceiling	2	d, g
g	erect roof	5	e
h	install door and windows	8	g
i	fit gutters and pipes	2	c, f
j	paint outside	3	i

(a) Draw a directed network representing the activities, their interdependencies, and their durations.

(b) Determine a sequence in which the activities can be executed.

(c) Assume that activities can be executed simultaneously as long as their interdependencies are met. Determine the minimum amount of time required to construct the garage, along with the set of activities that must be completed within their stated duration in order for the minimum time for the construction to be achieved.

Note: It is natural to represent activities by arcs and durations by weights. As some activities have more than one other activity they must follow or be followed by, you may have to introduce additional arcs or vertices to accurately model the interdependencies among activities. There is more than one way in which this can be done.