NAME:

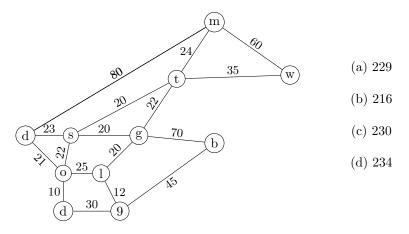
	Start	1	2	3	4	5	6	7	8
Grade:									

Graph Theory

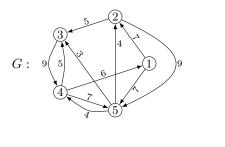
Written examination / C

04 February 2021

1. (0.75p) Which is the minimum weight spanning tree of the following connected graph? (hint: apply the Kruskal algorithm)



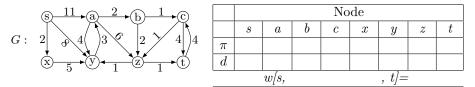
2. (1.5p) Given the following weighted digraph. Apply the Warshall algorithm to compute the matrix $WP^{[5]}$ of the lightest paths between any two nodes of G.



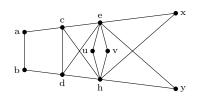


- 3. (0.50p) How many different trees with 5 nodes, labeled with numbers from 1 to 5, there exist?
 - (a) 10 (b) 5 (c) 25 (d) 125 (e) 3125

4. (1.25p) Consider the following graph. Apply the Dijkstra's algorithm in order to compute the lightest path from s to all the other nodes. Fill in the following table with the final results.

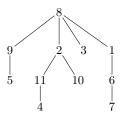


5. (0.50p) Is the following graph eulerian? Motivate your answer. In case it is, indicate an eulerian circuit.



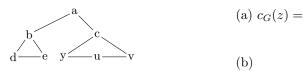


6. (0.75p) Which is the Prüfer sequence of the following tree?



(a) 8, 3, 4, 5, 7, 6, 1, 9, 10, 11, 2
(b) 3, 4, 5, 7, 6, 1, 8, 2, 10, 11
(c) 8, 11, 9, 6, 1, 8, 2, 2, 8
(d) 8, 11, 9, 6, 1, 8, 8, 2, 2

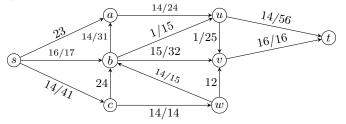
- 7. (2p) Consider the graph G. Compute:
 - (a) the chromatic polynomial $c_G(z)$ of G
 - (b) in how many ways can we color G with three colors
 - (c) indicate the chromatic number of G,
 - (d) how many 4-colorings has G?



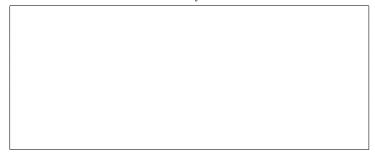
(c)

 $\mathbf{2}$

8. (1.75p) Consider the following flow network G with flow f depicted below:



(a) Indicate the residual network G_f .



- (b) Is f the maximum flow? If it is not, then indicate an augmenting path in G_f .
- (c) Determine a maximum flow in the flow network with source s and sink t, and indicate its value.

Start: 1p