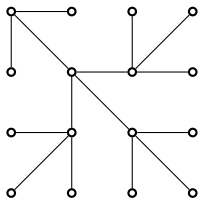
Coursework 1

COMP2721 Algorithms and Data Structures II

sample solutions

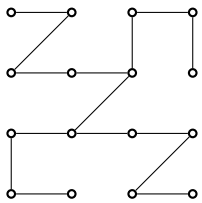
1. Breadth-first search: Below we give the BFS-tree, the BFS-numbering σ and the queue in the form (front, ..., end).



v	$\sigma(v)$	queue
a	1	( )
b	2	(e,f)
c	8	(d,h,i,m,n,l,o,p)
d	9	(h,i,m,n,l,o,p)
e	3	(f)
f	4	( )
g	5	(j,k)
h	10	(i,m,n,l,o,p)

v	$\sigma(v)$	queue
i	11	(m,n,l,o,p)
j	6	(k,c,d,h)
k	7	(c,d,h,i,m,n)
l	14	(o,p)
m	12	(n,l,o,p)
n	13	(l,o,p)
o	15	(p)
p	16	()

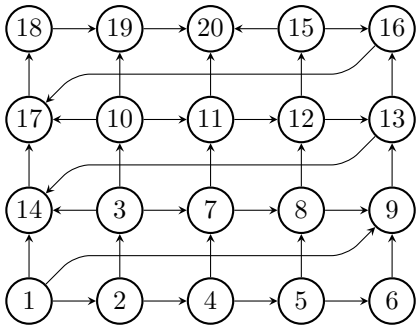
Depth-first search: Below we give the DFS-tree, the DFS-numbering σ and the stack in the form [top, ..., bottom].



v	$\sigma(v)$	stack
a	1	[]
b	2	[a]
c	6	[g,f,e,b,a]
d	7	[c,g,f,e,b,a]
e	3	[b,a]
f	4	[e,b,a]
g	5	[f,e,b,a]
h	8	[d,c,g,f,e,b,a]

v	$\sigma(v)$	stack
i	10	[j,g,f,e,b,a]
j	9	[g,f,e,b,a]
k	13	[j,g,f,e,b,a]
l	14	[k,j,g,f,e,b,a]
m	11	[i,j,g,f,e,b,a]
n	12	[m,i,j,g,f,e,b,a]
o	15	[l,k,j,g,f,e,b,a]
p	16	[o,l,k,j,g,f,e,b,a]

2. The topological ordering is given by the numbering of the vertices, and also in the table.



v	a	b	d	e	f	g	h	i	j	l	m	n	o	p	r	s	t	u	w	y
$\sigma(v)$	12	15	10	20	14	17	19	16	1	8	4	7	3	5	13	6	18	2	11	9