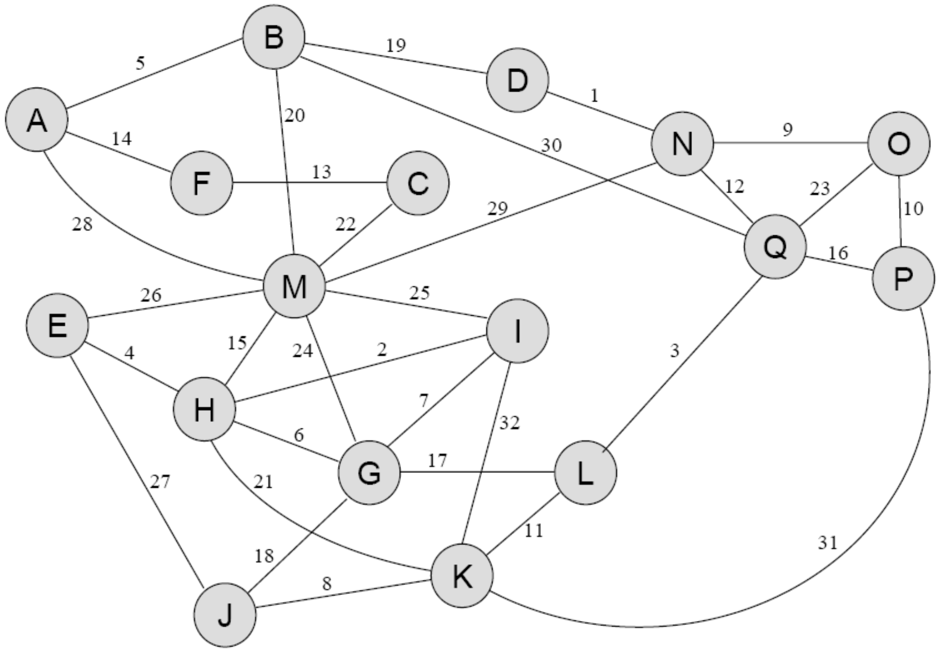
Solutions to the Week #13-14 Exercises – Fall, 2007

Exercise R.



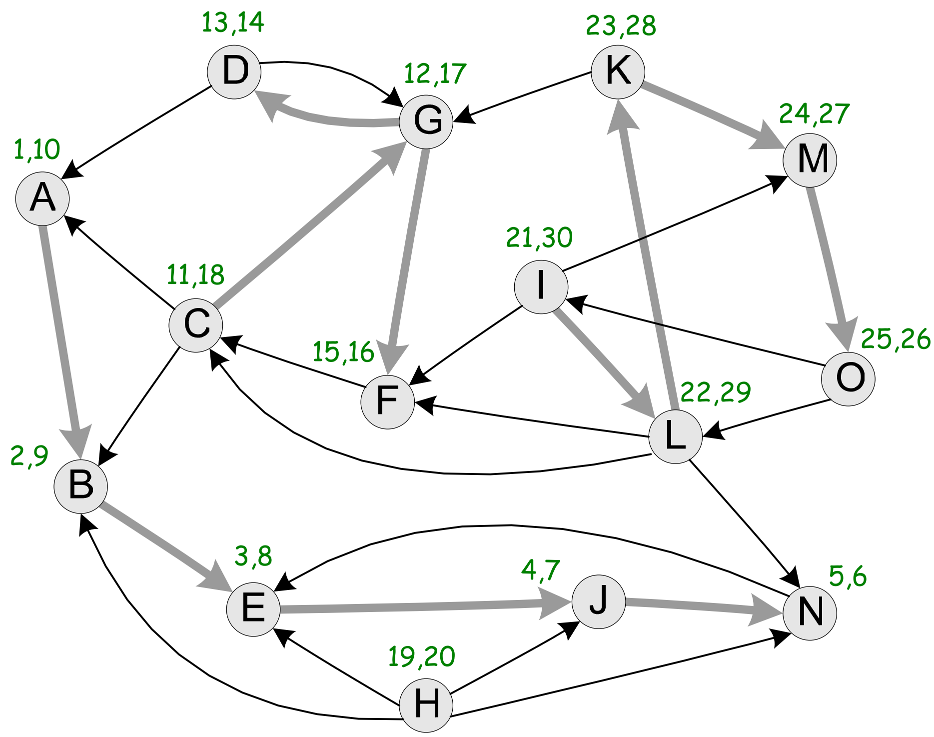
Edges and vertices selected (Prim)

New Edge	New Vertex	Weight
	A	
AB	B	5
AF	F	14
FC	C	13
BD	D	19
DN	N	1
NO	O	9
OP	P	10
NQ	Q	12
QL	L	3
LK	K	11
KJ	J	8
LG	G	17
GH	H	6
HI	I	2
HE	E	4
HM	M	15

Edges selected (Kruskal)

New Edge	Weight
DN	1
HI	2
QL	3
HE	4
AB	5
GH	6
KJ	8
NO	9
OP	10
LK	11
NQ	12
FC	13
AF	14
HM	15
LG	17
BD	19

S.

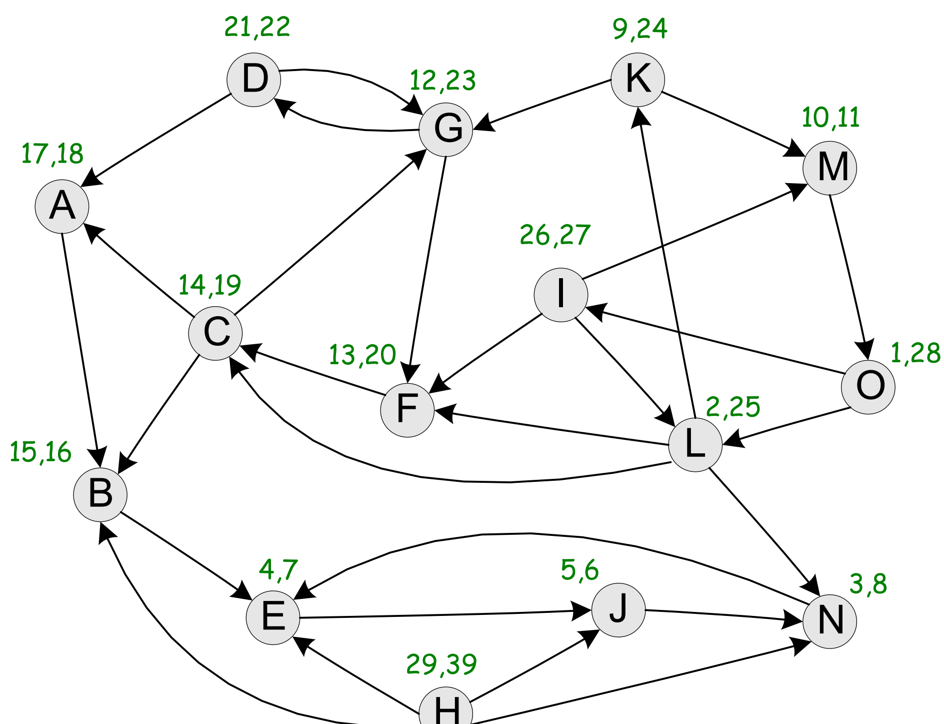


T. **a)** NE, DG, FC, OI, OL

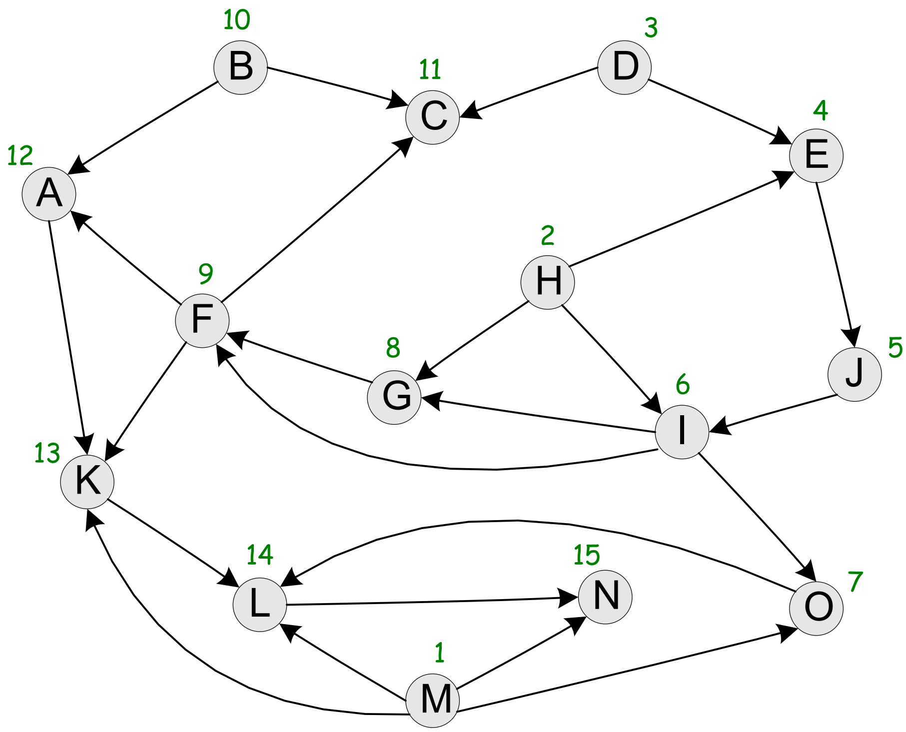
b) IM

c) CA, CB, DA, HB, HE, HJ, HN, IF, LC, LF, LN, KG

U.

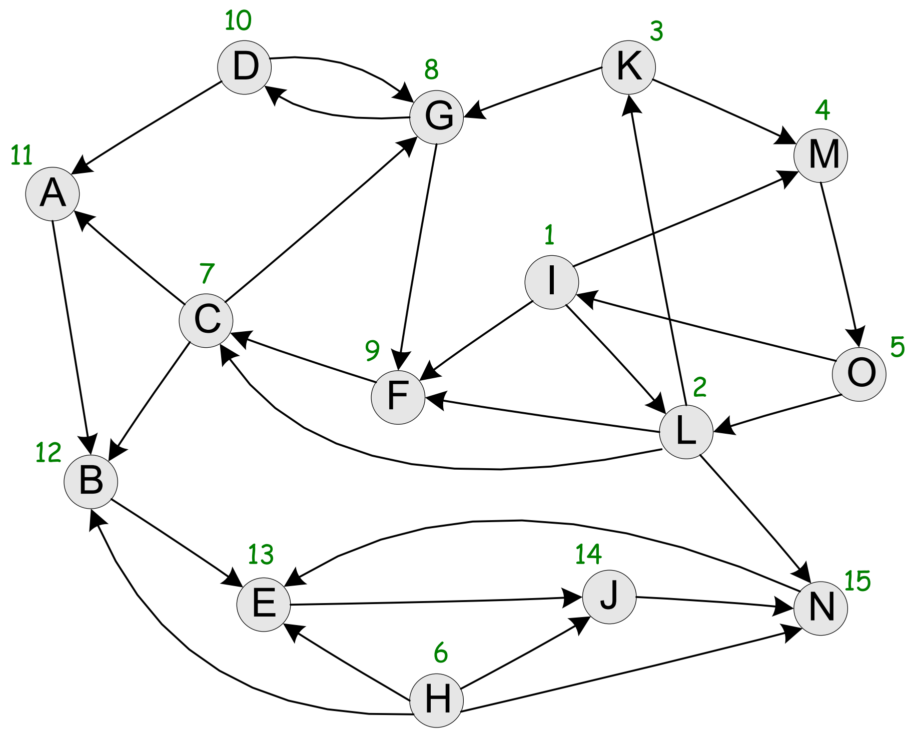


v.

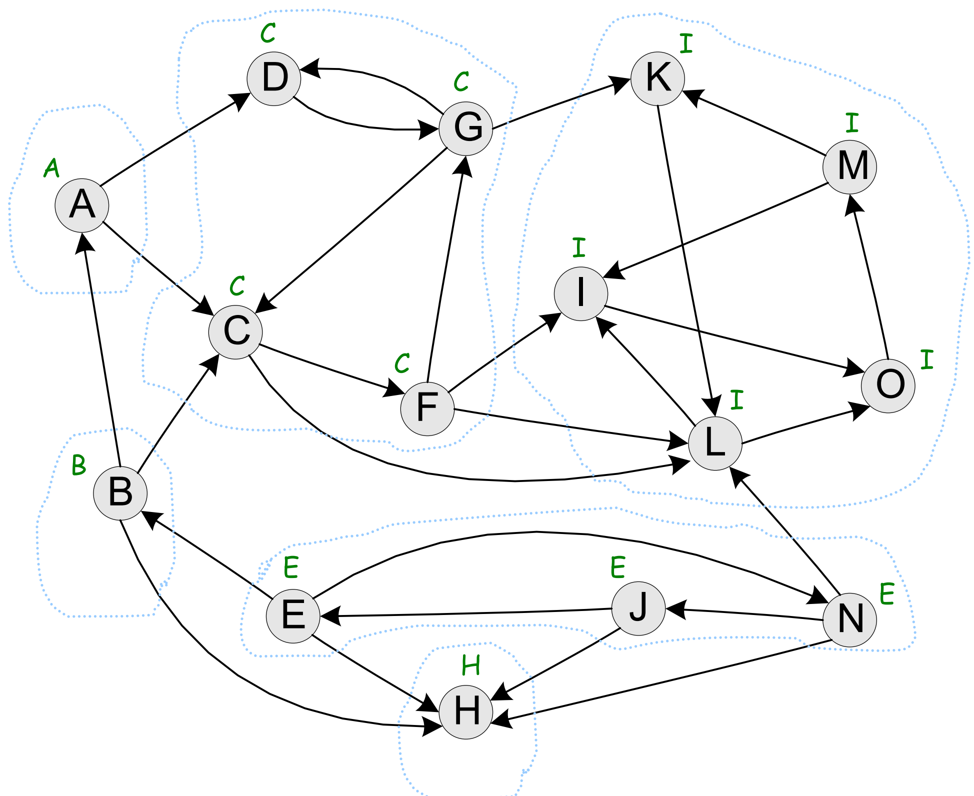


w.

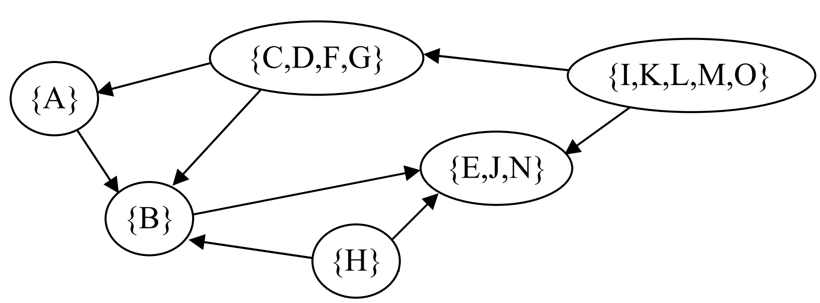
phase 1



phase 2



Note: The acyclic graph of strongly connected components is:



X. **a)** We showed in class that a graph is acyclic if and only if it has no back edges. If there are only cross edges, there can be no back edges, so the graph is acyclic.

b) Number the vertices in the order assigned in a reverse topological sort (xy an edge implies label(x) > label(y)). Then any vertex reachable from x must have a smaller label than x. Now do a depth first search always choosing the next starting vertex as the white vertex with the smallest label. When we choose the vertex x with label k as a starting vertex, the vertices with labels 1, 2, ..., k–1 will already be black. But these are the only vertices, other than x itself, that may be reachable from x. This means that the depth-first search starting vertex x discovers no vertex other than x , and thus finds no tree edges. Since there are no tree edges, there can be no back edges (edges that lead up the tree) and no forward edges (edges that lead down the tree). Every edge must be a cross edge.