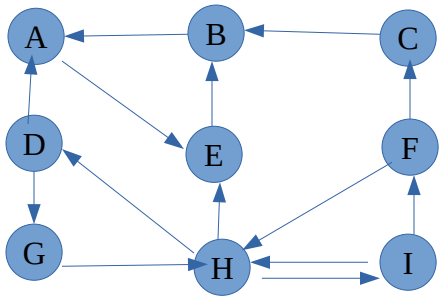
Assignment 3

1. Find SCC's

Step 1: Run DFS on the graph

DFS starting from A with pre and post numbers: (A:[1,18], B : [2,17], C : [3,14], F : [4,13], I : [5,12], H : [6,11], G : [7,10], D : [8,9], E : [15,16])

Step 2: Reverse the graph edges G^R:



Step 3: Run DFS on each node in order of decreasing post number looking at each node only once

(a) A B E C F I H G D

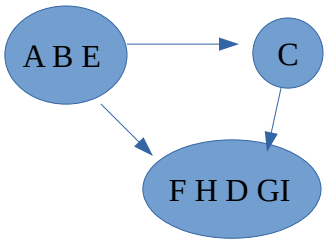
A : A B E

C : C

F : F H D G I

(b) (A B E) are the source and (F H D G I) are the sink

(c)



(d) One edge that is from D→E

2. Dijkstra's algorithm

(a)

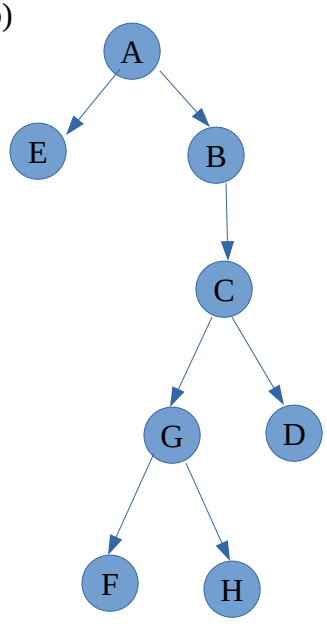
ITER		1 A	2 B	3 C	4 D	5 E	6 G	7 F	8 H
QUEUE	DIST:PREV								
A	0	0	0	0	0	0	0	0	0

B	∞	1:A	1:A	1:A	1:A	1:A	1:A	1:A	1:A
C	∞	∞	3:B	3:B	3:B	3:B	3:B	3:B	3:B
D	∞	∞	∞	4:C	4:C	4:C	4:C	4:C	4:C
E	∞	4:A	4:A	4:A	4:A	4:A	4:A	4:A	4:A
F	∞	8:A	7:B	7:B	7:B	7:B	6:G	6:G	6:G
G	∞	∞	7:B	5:C	5:C	5:C	5:C	5:C	5:C
H	∞	∞	∞	∞	8:D	8:D	6:G	6:G	6:G

dist = [A:0, B:1, C:3, D:4, E:4, F:6, G:5, H:6]

prev = [A:A, B:A, C:B, D:C, E:A, F:G, G:C, H:G]

(b)



3. MST Kruskal's algorithm

(a) Sort the edge weights by increasing order

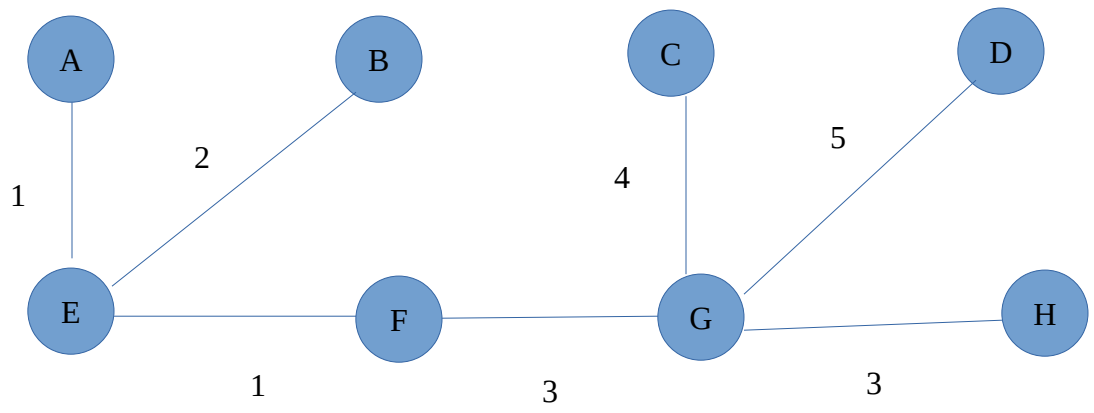
[A,E]=1 [E,F]=1 [B,E]=2 [B,F]=2 [F,G]=3 [G,H]=3 [C,G]=4 [F,C]=5 [G,D]=5 [B,C]=5 [A,B]=6 [C,D]=6 [D,H]=7

Next pick the smallest value edges that does not make a cycle until all nodes have been seen

[A,E]=1 [E,F]=1 [B,E]=2 [F,G]=3 [G,H]=3 [C,G]=4 [G,D]=5

(b) Total cost

1+1+2+3+3+4+5 =19


A
B
C
D
E
F
G
H
1
2
4
5
1
3
3