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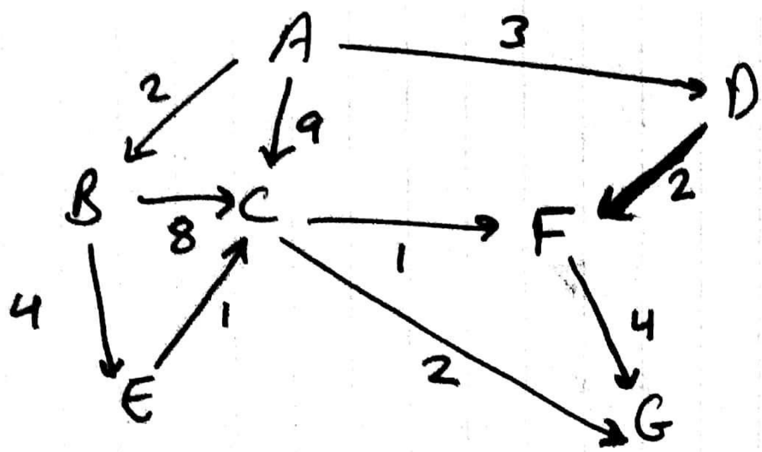
CSC 226 Assignment 3 Written

1)



D[]

	A	B	C	D	E	F	G
0)	0	+∞	+∞	+∞	+∞	+∞	+∞
1)	0	2	9	3	+∞	+∞	+∞
2)	0	2	7	3	6	~~8~~5	11
3)	0	2	7	3	6	5	9
4)	0	2	7	3	6	5	9
5)	0	2	7	3	6	5	9

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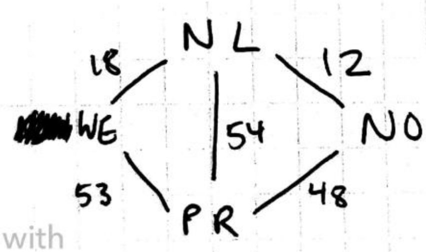
2) Longest-Path (DAG G, Vertex src)
D[src] ← 0
for all u in V where u ≠ src do
D[u] ← −∞
~~sort ← topologicalSort(G~~)
sorted[] ← topologicalSort(G)
for u in sorted[] do
~~if (D[~~
for all adj v to u do
if (D[v] < D[u] + w((u,v))
D[v] ← D[u] + w((u,v))

3)

	Providence	Westerly	New London	Norwich
Providence	0	53	54	48
Westerly	53	0	18	~~101~~ → 30
New London	54	18	0	12
Norwich	48	~~101~~ → 30	12	0



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4a) If $M^2(i,j) = 1$, then there is a path from i to j involving at most one intermediate vertex; so there exists at least one path where $(i,k), (k,j) \in E$, or $(i,j) \in E$.

If $M^2(i,j) = 0$, then there is no such path, i.e. $(i,k), (k,j) \notin E$ and $(i,j) \notin E$.

b) $M^4(i,j) = (M^2(i,1) \cdot M^2(1,j)) + (M^2(i,2) \cdot M^2(2,j)) + \dots + (M^2(i,n) \cdot M^2(n,j))$

$M^k(i,j) = (M^{\sqrt{k}}(i,1) \cdot M^{\sqrt{k}}(1,j)) + (M^{\sqrt{k}}(i,2) \cdot M^{\sqrt{k}}(2,j)) + \dots + (M^{\sqrt{k}}(i,n) \cdot M^{\sqrt{k}}(n,j))$

for any $1 \leq k \leq n$, $M^k(i,j)$ shows if there is a path with up to k edges from i to j

5) If $M^2(i,j) = d$, then there is a directed path from i to j with at most one intermediate vertex from i to j, with path weight d.

For $M^k(i,j) = d$, there is a directed path from i to j with at most k edges, with path length d.