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rep127

I have not discussed this exam with anyone except the professor and the TAs of CS 344. I have not used any online resources during the exam except for those accessible from the Canvas website.

Problem 1

Part 1:

S	A	E	D	C	F	B
0	3	4	7	8	9	14

Part 2:

F →A→D→B→C→E→G

F →A→D→B→C→G→E

Problem 2

Part 1:

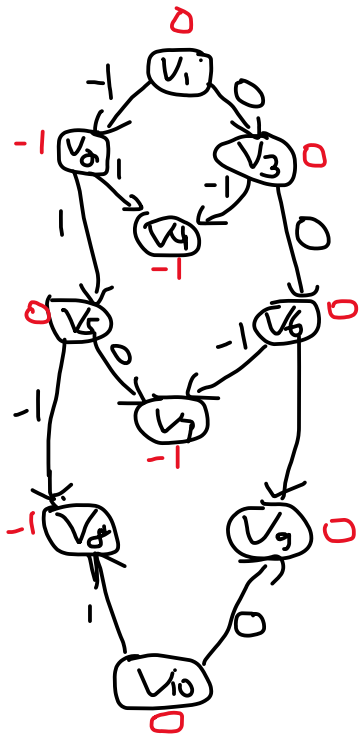
$$w'(x,y) = w(x,y) + \theta(x) - \theta(y) \geq 0$$

If P is the shortest x-y path in G then it is also a shortest x-y path in G' and vice versa

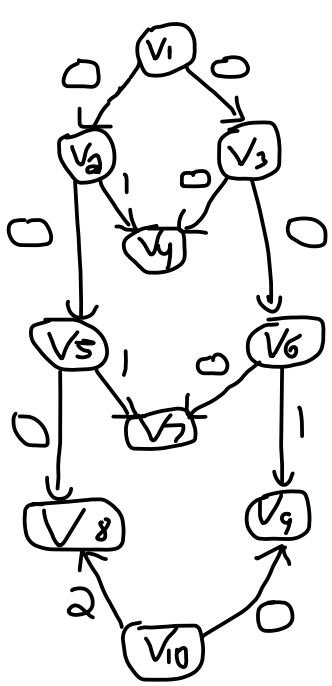
For every pair of vertices(x,y) E G, DIST'(x,y) = DIST(x,y) + θ (x) + θ (y)

Part 2:

G



G'



The maximum possible w'(x,y) is 2 for the edge (v_{10}, v_8)

Problem 3:

1. T[i][j] is true of there exists S' C_ {s_i, …s_n}such that $\sum_{x \in S}, x = b$ and count of red elements ≤ 100
2. DP relation T[i][j] is true if T[i-1, j] is true and count of red elements is ≤ 100
3. T[i][j] = 0
4. Return true if T[i][j] ≤ 100 red Elements else return false
5. Pseudocode:

```
subsetSumWithRedElements(int arr[], int n, int sum)
    Create boolean 2D array with 2 rows and sum + 1 columns
    For i = 0 until i <= n while i++ every loop
        For j = 0 until j <= sum while j++ every loop
            If i = 0
                Set T[i % 2][j] = false
            Else If j = 0
                Set T[i % 2][j] = true
            Else if arr[i - 1] <= j
                //set current index based on the true or false values
                Set T[i % 2][j] to T[(i + 1) % 2][j - arr[i - 1]] OR T[(i + 1) % 2][j]
            Else
                T[i % 2][j] = T[(i + 1) % 2][j]
            End Else If
        End For
    End For
    Let counter = 0
    For loop through T starting at T[n % 2][sum] working backwards
        Go up one row

        If value is true
            Check if color is Red if so add 1 to counter

            Go up one row

        Else
            Go up one row and go back sum amount of columns

        End Else If
```

```
        End For
  If counter <= 100
        return true
  else
        return false
End Function
```

Problem 4

1. T[n] is the number of paths from the source vertex to the destination vertex in DAG G where the number of edges is ≤ 100
2. DP relation: Total paths is ≤ 100 edges for all paths from vertex s to destination t
3. T[n] = 0
4. Sum of T[n]
5. Return Pseudocode:

The following is a modified version of the BFS algorithm which runs in 0(|E|) time complexity

Create a queue which will store path(s) to process

Initialize the queue with first path starting from src

Create new array T[n] to hold all of the valid paths from src to dest

Loop through queue till is not empty

  Get the frontmost path from the queue

  check if the last node of this path is the same as the dest

    If the length of the path - 1 <= 100 then

        Add path to T[n]

    Else

        Break out of the loop

    End If

  Loop through all the vertices connected to the current vertex

    If the vertex is not visited in current path

      Create a new path from earlier path and append this vertex

      Insert this new path to queue

    End IF

Return the size of T[n]

Problem 5:

I don’t know