ASSIGNMENT

Department of Computer Science & Engineering

TOPIC:

DYNAMIC PROGRAMMING SOLUTION FOR STEINER TREE

SUBMITTED BY

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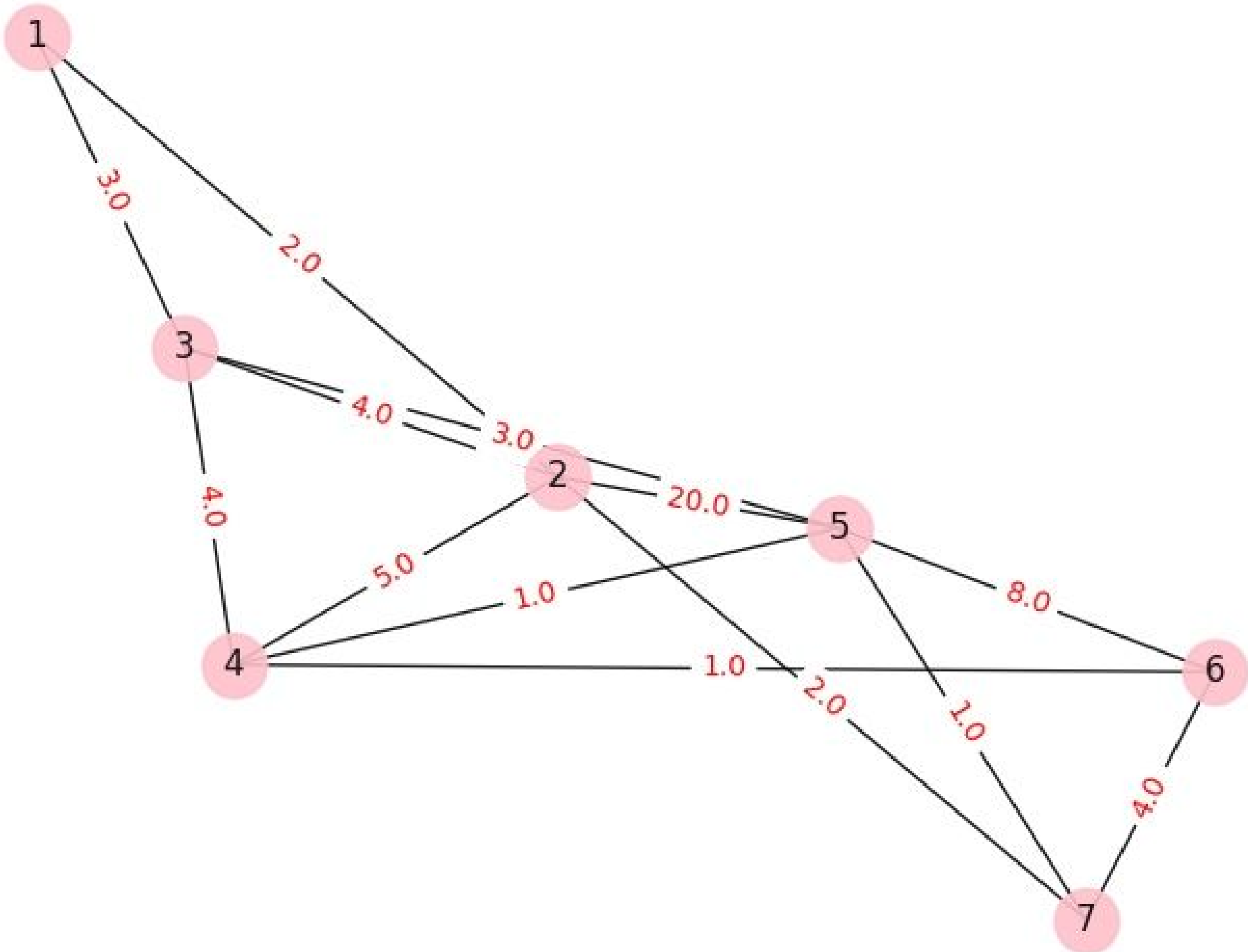
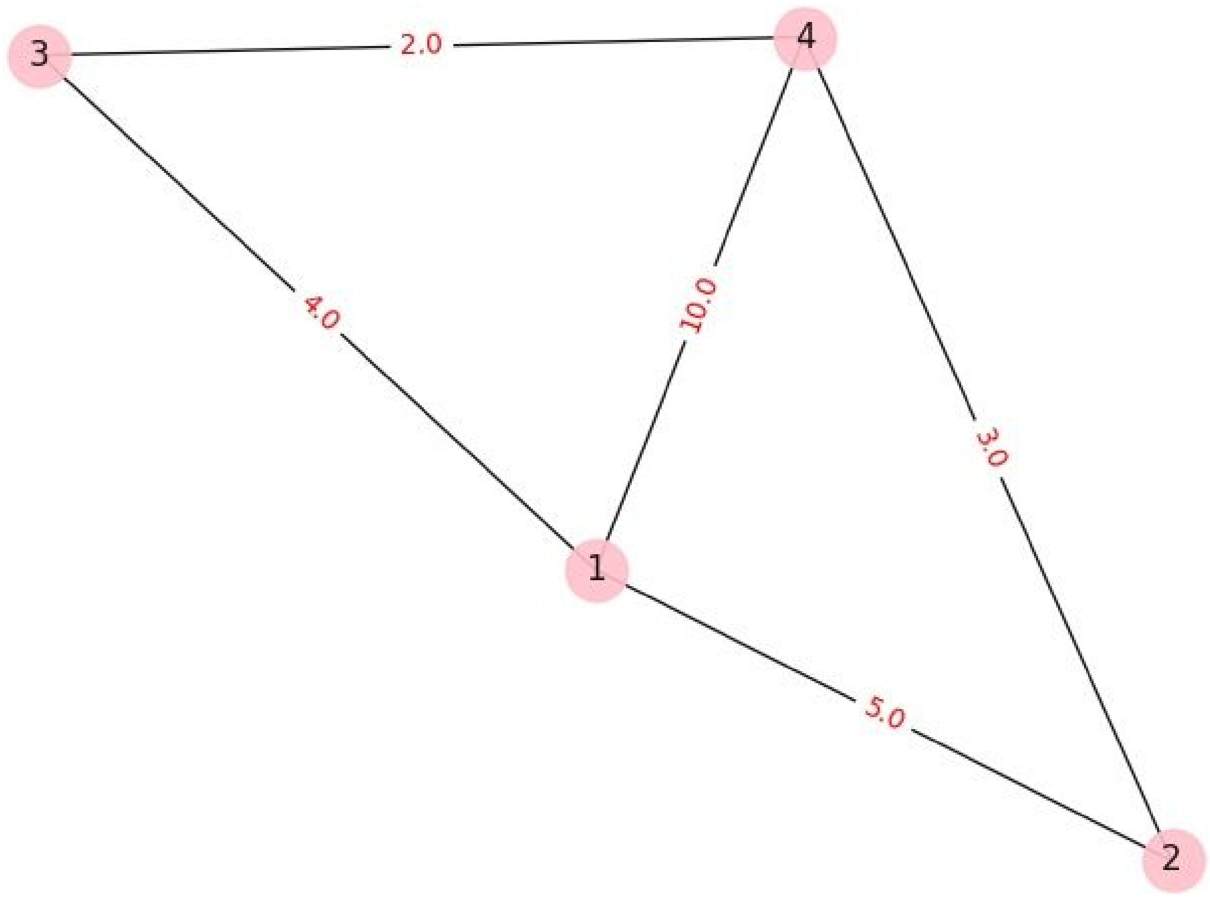
<u>TEST CASES</u>

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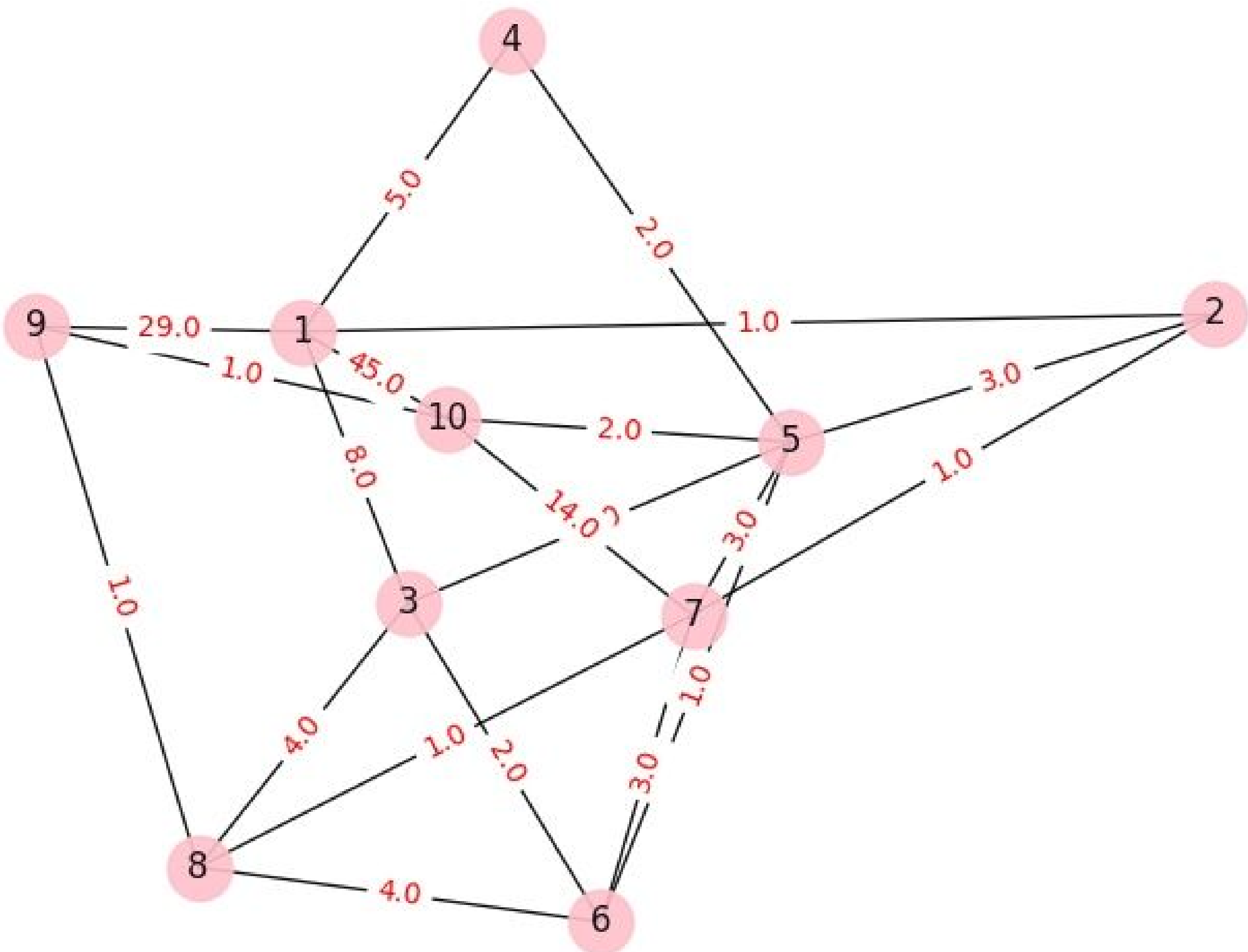
4
4.0
10.0
3.0
1
5.0
2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2.0
9
29.0
1
1.0
2
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1.0
10
2.0
5
3.0
8.0
1.0
14.0
3.0
1.0
3
7
1.0
4.0
1.0
2.0
3.0
8
4.0
6

PROOF:

The proof goes by dynamic programming.

Pick any terminal 't_0' and let $T' = T \setminus \{t_0\}$.

For every nonempty $X \subset T'$ and every $v \in V$ we compute:

$ST(X,v)$ = minimum edge weight of a Steiner tree for $(X \cup \{v\})$

Note that we allow $v \in X$ The answer is stored in$ST(T', t_0)$

1-The trivial case: If $X=\{x\}$ for some $x \in T'$

then for every $v \in V$ we set

$ST(\{x\},v) = dist_G(x,v)$.

2-Now suppose $|X| \geq 2$ Look at the tree from v Starting from v go along the tree until you reach either a vertex in X or a vertex of degree at least

3. Let us call it u. Possibly u=v.

If $u \in X$ then we let$X'=\{u\}$.

Otherwise we let X' be the vertices in X in one connected component of the tree with {u} removed.In both cases we have $\varnothing != X'$ (X and the tree can be split into three pieces

- the path fromv to u(possibly trivial)
- a tree for u and X'(possibly trivial)
- a tree for u and $X \setminus X$

$ST(X,v) = \min_{v \in V}(dist_G(v,u)$ +(for all subset x')$\min(ST(X',u) + ST(X \setminus X',u)))$

Running time:

Each vertex of T'can be either in X', in $X \setminus X'$, or in $T' \setminus X$.

There are $3^{t-1} * n^2$ evaluations of the recurrence