ASSIGNMENT

Department of Computer Science & Engineering

TOPIC:

DYNAMIC PROGRAMMING SOLUTION FOR STEINER TREE

SUBMITTED BY

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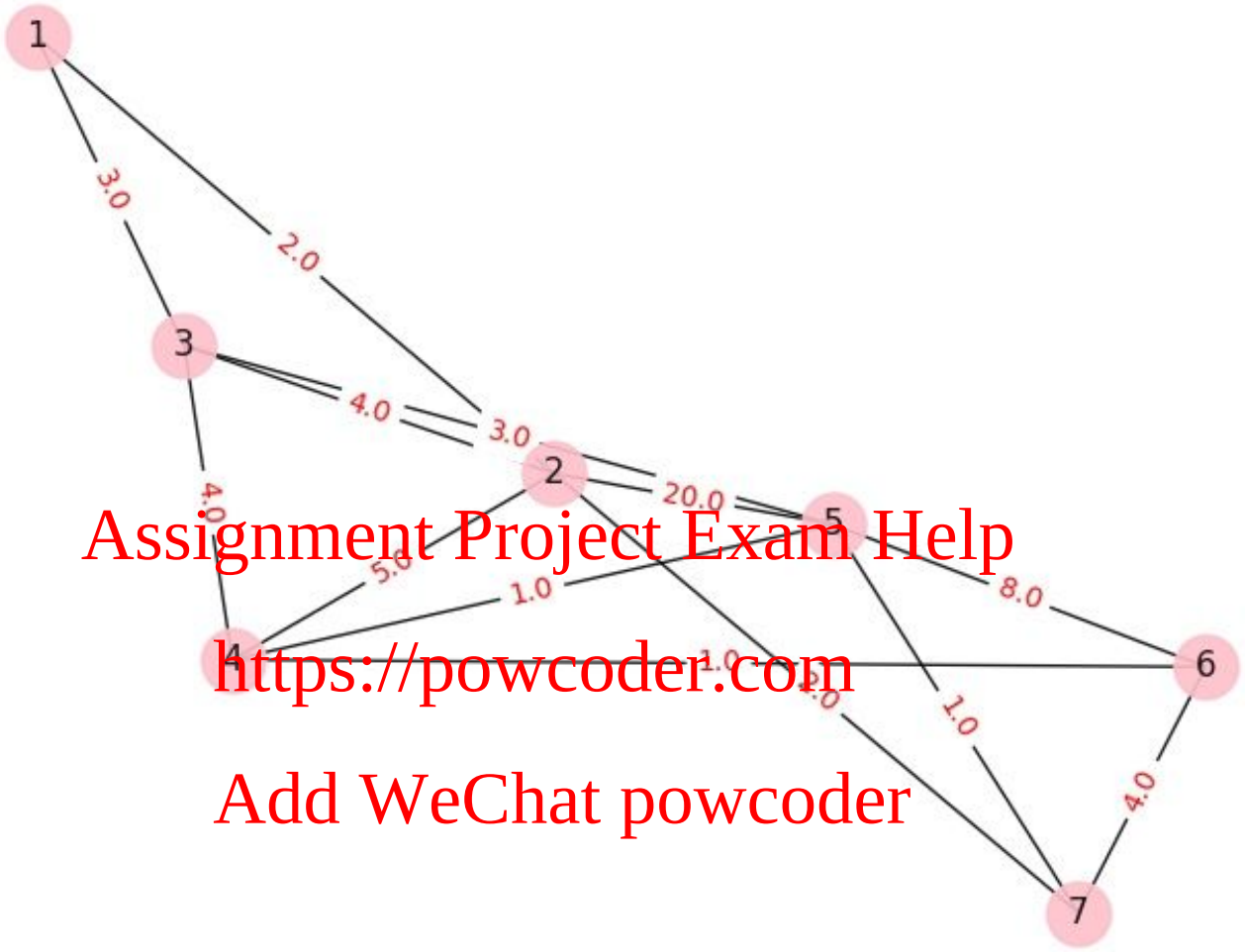
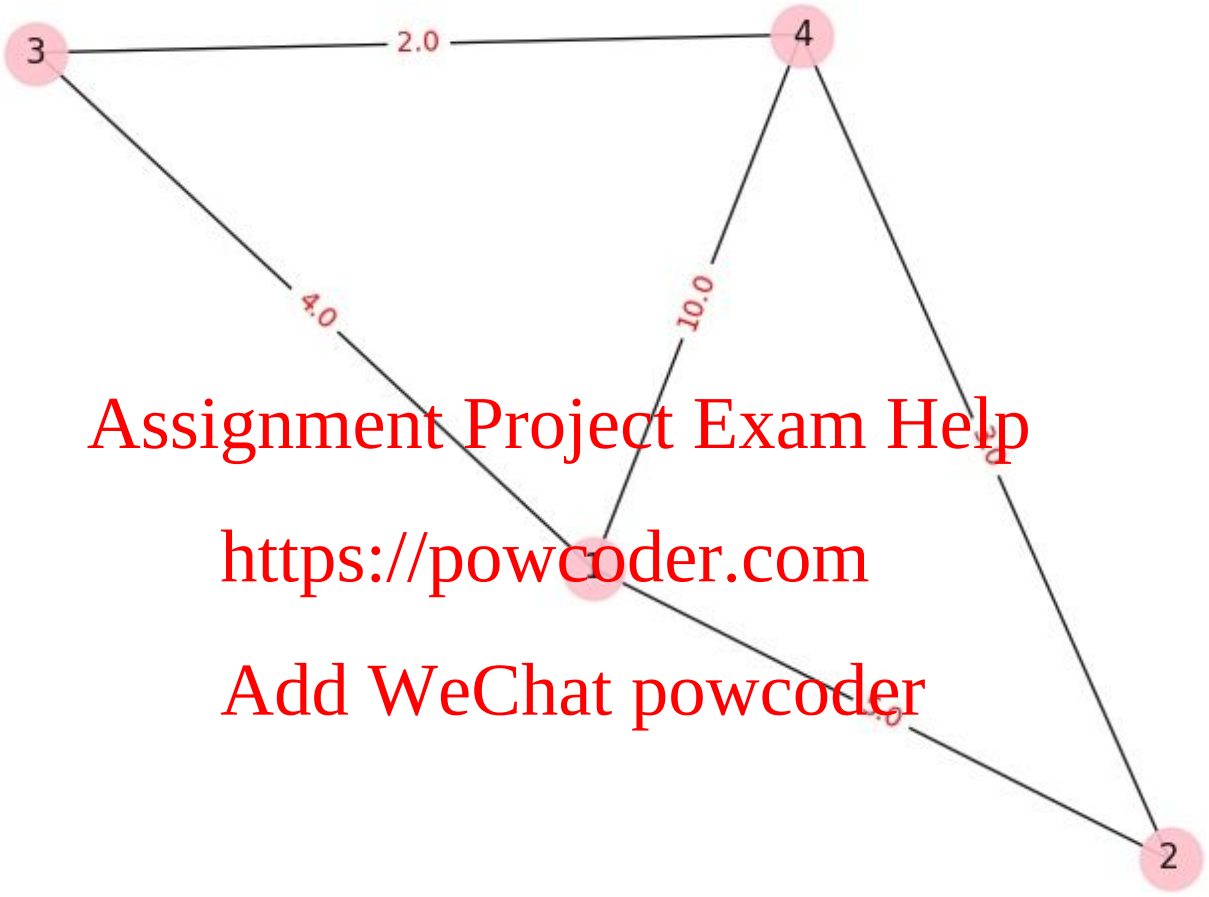
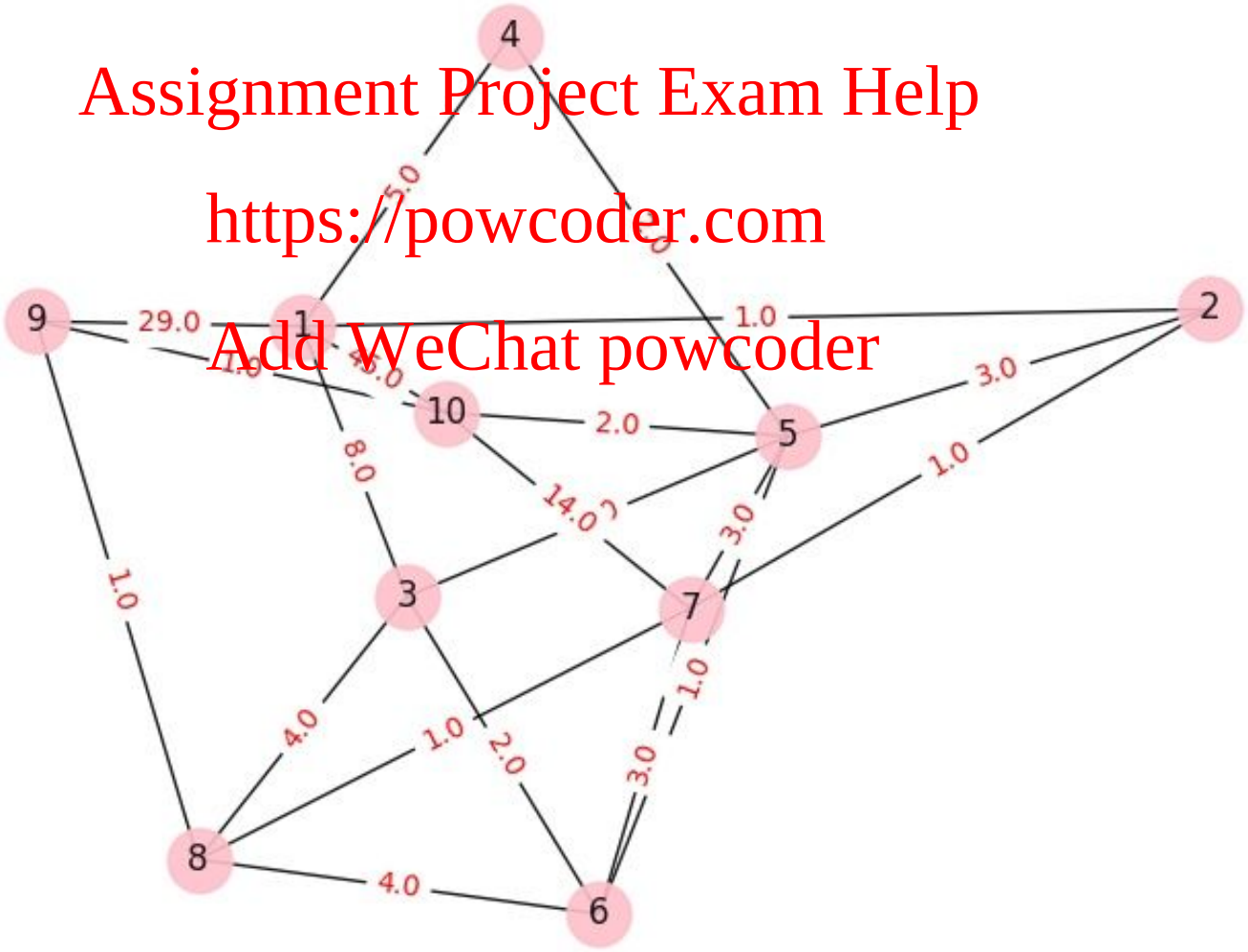
TEST CASES







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 $\emptyset \neq X' \subset X$ 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\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\X′, or in T′\X.

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