MINIMUM VERTEX COVER USING BINARY SEARCH

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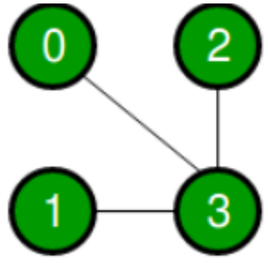
INTRODUCTION

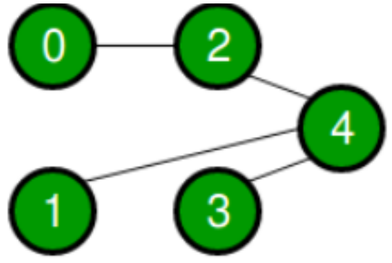
WHAT IS VERTEX COVER?

A vertex cover of an undirected graph is a subset of its vertices such that for every edge (u, v) of the graph, either ‘u’ or ‘v’ is in the vertex cover. Although the name is Vertex Cover, the set covers all edges of the given graph.

Minimum vertex cover is empty{}

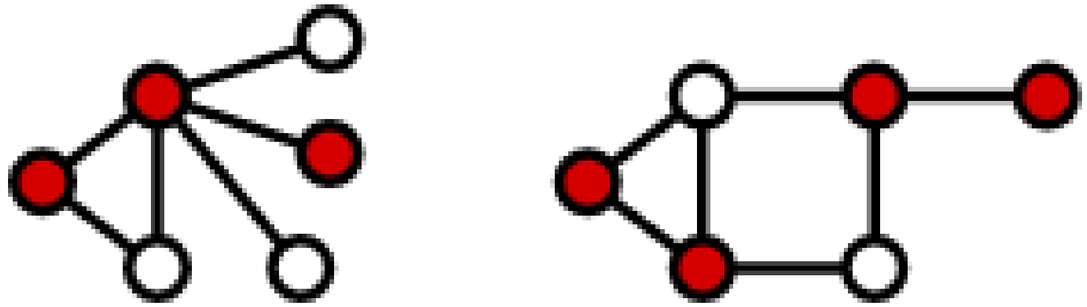


Minimum vertex cover is {3}

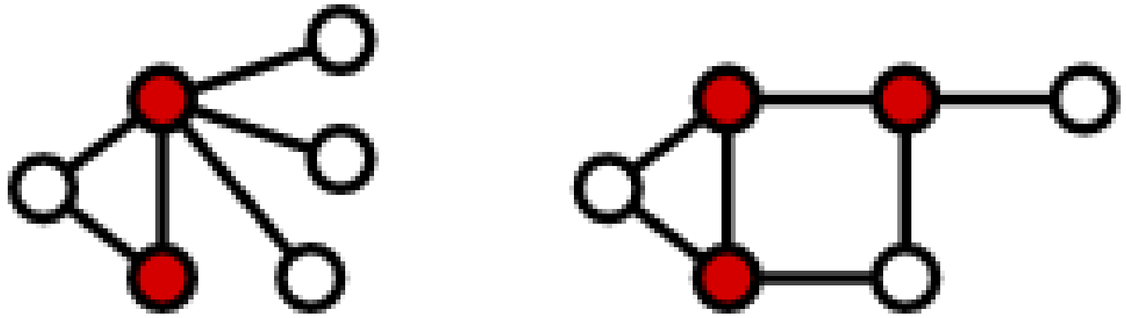


Minimum vertex cover is {4, 2} or {4, 0}

EXAMPLE



Examples of vertex covers



Examples of minimum vertex covers

PROBLEM STATEMENT

- Find the size of the minimum size vertex cover, that is, cardinality of a vertex cover with minimum cardinality, for an undirected connected graph with V vertices and m edges.
- It is a NP Complete problem.

Algorithm using binary search

```
check(Vertex,Edge)
    mid = (left+right) >>1
    if (isCover(Vertex, mid, Edge) == false)
        left = mid+1
    else
        right = mid
    return left


isCover(Vertex, k, Egde)
    while(set<limit)
        j = 1, v= 1,
        for every vertex k
            check if edge exists to all other vertices and increment count
            if count of above == edges
            then return true
    return false
```

TIMECOMPLEXITY

NAIVE SOLUTION

TC = O((E + V) * 2V)

USING BINARY SEARCH

*TC = O (E * (VCV/2 + VCV/4 + VCV/8 +... upto VCk))*

These terms are not more than log(V) in worst case.

THANK YOU