Hamiltonian Circuit — (Backtracking)

This problem looks similar to Travelling Salesman problem :: In TSP, we also start from source vertex to visit all the vertex at once & back to source vertex. But TSP is a minimization problem where we have to find out minimum cost

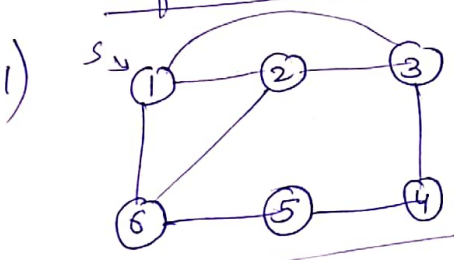
But in Hamiltonian Circuit → we find out all possible path. Few important things are:

→ the graph given may be directed or non directed graph but it must be connected. If it is not connected then the cycle is not possible.

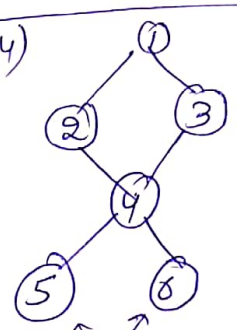
→ This is a N-P Hard problem means exponential time taking problem. So, there is no easy way to find if there is any hamiltonian cycle present in the graph or not.

For Example :-

Let find out manually :- More than one cycle Possible :-

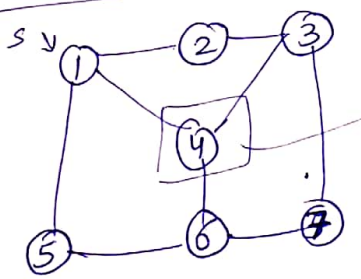
1) 

1 2 3 4 5 6 1
1 2 6 5 4 3 1
1 6 2 5 4 3 1
:

4) 

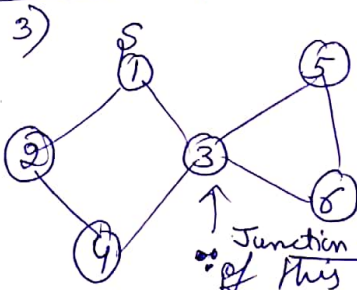
No Hamiltonian cycle Possible.

Pendant vertices

2) 

1 → 2 → 3 → 4 → 6 → 7 ✗

No Hamiltonian cycle Possible

3) 

articulation Point

Junction of a graph

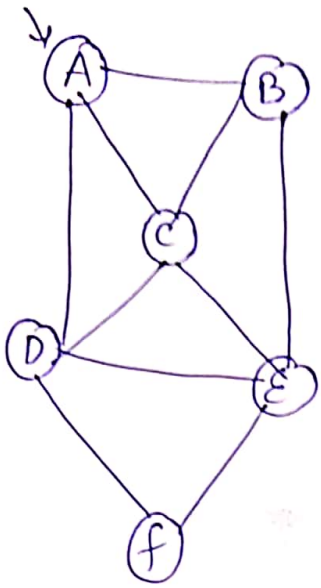
∴ of this

No Hamiltonian cycle possible

Example:-

HAMILTONIAN CIRCLE/CIRCUIT :-

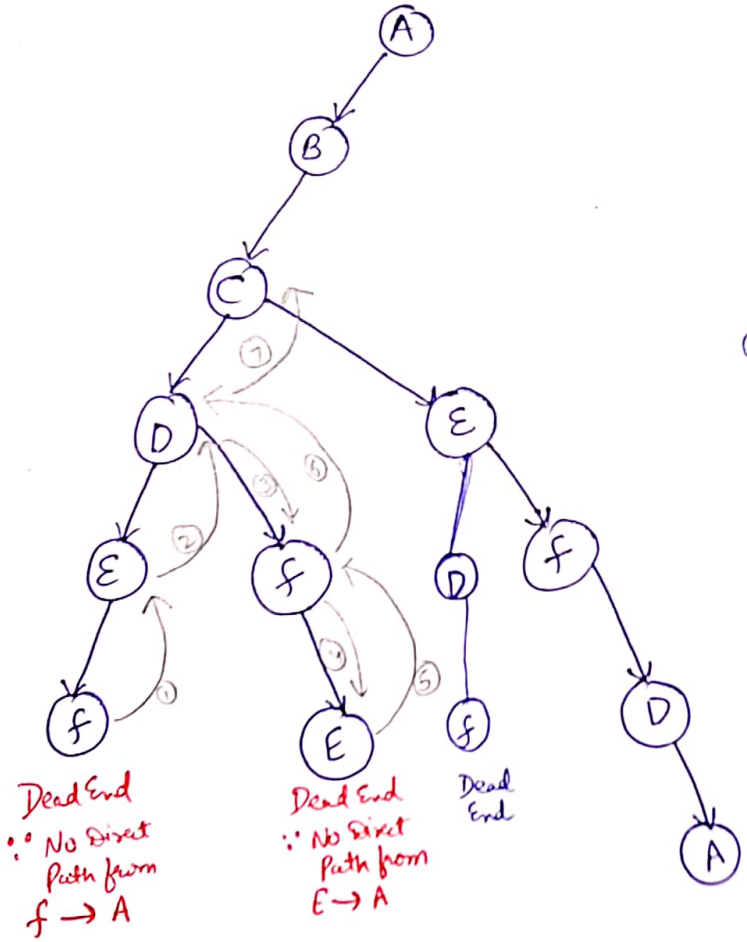
(Back-Tracking)



Problem:- If a graph is given, you have started from source vertex & visit all the vertex exactly once & return back to the starting vertex, so that forms a cycle.

So, we have to check that is there any Hamiltonian cycle possible in a graph. If possible then what is a cycle & if there are multiple cycles we have to find out all those cycles.

So, the problem is to find out if there is any Hamiltonian cycle in a graph or Not.



Path → A → B → C → E → F → D → A Ans.

* There may be more than 1 path for the solution to reach A → to all nodes back to