ESO207 Programming Assignment-3

Due on: 23:59 hrs, Nov 10, 2021
Maximum Marks 50

Instructions

- Please insert suitable comments in your pseudo-code and actual code so that anyone grading it may understand it easily.
- Present your arguments clearly and stay to the point.
- Runtime complexity of your program may be assessed from complexity analysis of your pseudo-code and by checking the fact that you have implemented that pseudo-code.
- No marks shall be awarded for an algorithm/program not working in the prescribed theoretical time bounds.

Q1 (Marks 20 + 5 + 25) An undirected graph $G(V, E)$ is said to be bipartite if V can be partitioned into two sets V_1, V_2 such that all edges of G are between sets V_1 and V_2 (That is each edge of G has one endpoint in V_1 and other endpoint in V_2).

More mathematically, there exists non-empty and disjoint sets V_1 and V_2 s.t. $V = V_1 \cup V_2$ and $E \subseteq (V_1 \times V_2) \cup (V_2 \times V_1)$.

(a) You are given an undirected connected graph $G(V, E)$ in adjacency list representation. Write pseudo-code $Bipartite(G)$, which answers if G is bipartite or not. If G is bipartite, it returns (V_1, V_2) where (V_1, V_2) is a partition of V such that all edges of G are between V_1 and V_2. Your algorithm should work in $O(|V| + |E|)$ time.

(b) In part (a), if G is bipartite then is the partition of vertices unique? What best can you say about it. What if G is not connected.

(c) Implement your algorithm $Bipartite(G)$. A hackerrank contest will be opened for it soon.

——— End of Assignment ———