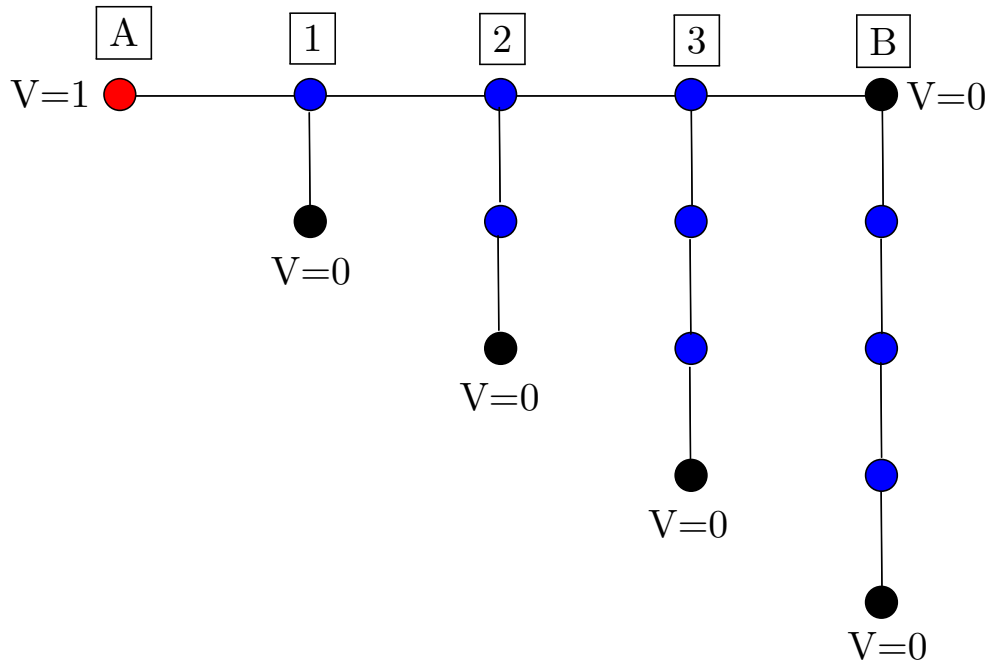For maximum credit, **you must explain your answers clearly**.

All questions below relate to the following graph which is an electric circuit in which all edges have unit conductance:

Node $\boxed{A}$ is set to unit voltage $V = 1$. There are 5 nodes that are grounded where the voltage $V = 0$, as indicated. Kirchhoff's current law holds at all other nodes.

(a) <u>Without</u> writing down the incidence matrix associated with the graph, find the rank of the incidence matrix and the dimension of its left nullspace.

(b) Determine the effective conductance between node $\boxed{A}$ and the grounded nodes (that is, determine the net current out of node $\boxed{A}$).

(c) Find the voltage at each of the nodes labelled $\boxed{1}$, $\boxed{2}$ and $\boxed{3}$.

THE END