Question#3

Proof idea:

To proof the minimum run time complexity for Prim algorithm in adjacency matrix format, I will walk through how Prim algorithm work and count the minimum number of data need to read in order to find the MST.

Proof detail:

Prim algorithm is a greedy algorithm, it has a beginning node, and search all other node with minimum cost. With this, Prim’s algorithm will always selects the least cost edges and add the corresponding node into the explored list. Therefore, it will at least go through all the nodes since this algorithm need to find all the node and only add one of them into the answer list in each search. And also every time when it explored a new node it need to go through all the node currently connected to all explored node and figural out the minimum cost edges which in matrix format need to go through all nodes. (it will take at least O(n) since it is on adjacency matrix format), So overall at the end it takes O(n^2) which is same as O(V^2).

Source:

Lecture note, Prim algorithm, course website reference page.