The problem is in $\mathcal{NP}$ since we can exhibit a subset E' of the edges, and it can be checked in polynomial time that at most a nodes in X are incident to an edge in E', and at least b nodes in Y are incident to an edge in E'.

We now show that *Set Cover* is reducible to this problem. Given a collection of sets $S_1, \ldots, S_m$ over a ground set U of size n, we define a bipartite graph in which the nodes in X correspond to the sets S_i, and the nodes in Y correspond to the elements in U. We join each set node to the nodes corresponding to elements that it contains. We also set $a = k$ and $b = n$. (In particular, this means that our (a, b)-skeleton must touch every node in Y.)

Now, if G has an (a, b)-skeleton E', then the k nodes in X incident to edges in E' correspond to k sets that collectively contain all elements, so they form a set cover. Conversely, if there is a set cover of size k, then taking E' to be the set of all edges incident to the corresponding set nodes yields an (a, b)-skeleton.

[1] ex748.182.100