(a) Removing the edge (A, G)
Original Q: 0.1947
New Q: 0.2358 (approximately)
Why does it increase?
The edge (A, G) connected two different communities. By removing a cross-community edge, the two communities become more isolated from each other. Without that "bridge," the communities are more internally dense compared to how many edges they have to nodes outside. This makes them look more "modular" and increases the modularity score. In other words, removing edges that connect different communities reduces inter-community mixing, thereby making the partition look stronger (more distinct and separate).

(b) Adding the edge (E, H)
Original Q: 0.1947
New Q : 0.2064 (approximately)
Why does it increase (but only slightly)?
Nodes E and H are in the same community. By adding a new edge within a community, you increase that community's internal connectivity. More internal edges mean the community is more cohesive. This tends to raise modularity, because you're reinforcing the pattern of having dense connections inside communities and fewer connections outside. The increase is smaller than in part (a) because you're just adding one intra-community link, which modestly improves internal cohesion.

(c) Adding the edge (F, A)
Original Q: 0.1947
New Q : 0.1600 (approximately)
Why does it decrease?
Unlike the (E, H) link, (F, A) connects nodes from different communities. Adding this cross-community edge introduces more "mixing" between the communities. The more communities become interconnected, the less distinct they appear, causing modularity to drop. A lower Q reflects that the partition is not as strong in separating the network into well-defined clusters.