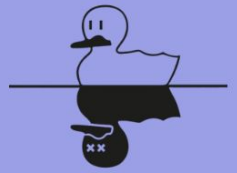
iQuHACK



Superquantum
MIT iQuHack 2026 Challenge

By: CanQbit

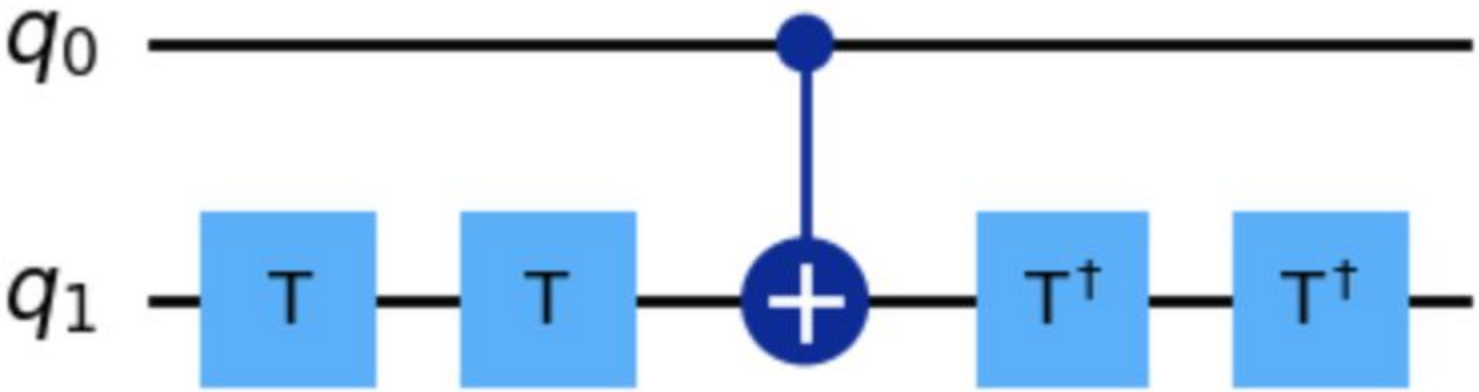
Members: Pavitra Bhargavi Allamaraju (University of British Columbia, Canada) and Ryan Ma (University of Waterloo, Canada)

Superquantum

qBraid

Q1

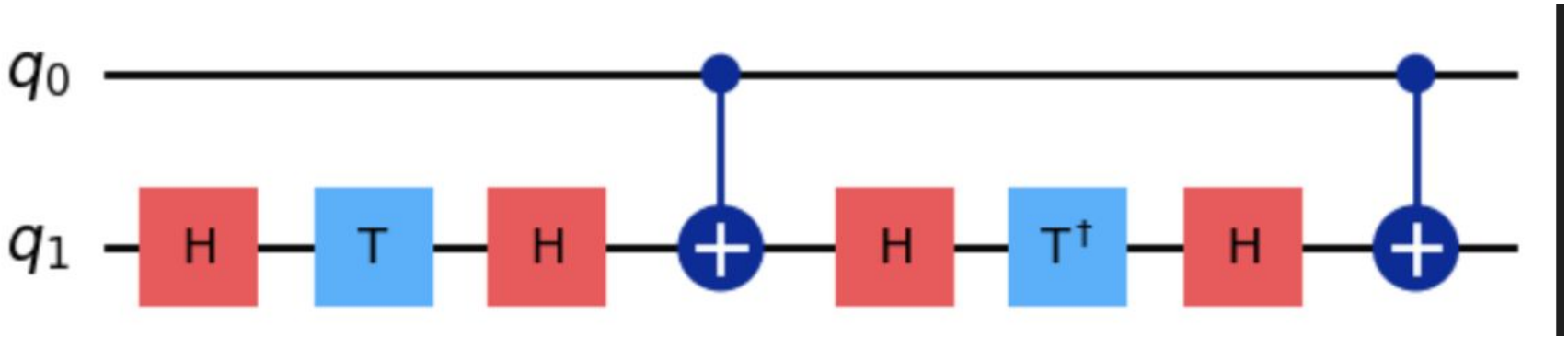
From Section 4. $SXS^\dagger = Y,$ Therefore a CY can be written as



Q2

Control-RY can be decomposed into $\left(\hat{I} \times Ry\left(\frac{\theta}{2}\right)\right) CX \left(\hat{I} \times Ry\left(-\frac{\theta}{2}\right)\right) CX$

As Ry = H Rz H and a rotation of pi/14 is ~pi/16 = T gate



Q3

We know that $Z \times Z = CX\ (\hat{I} \times Z)CX$

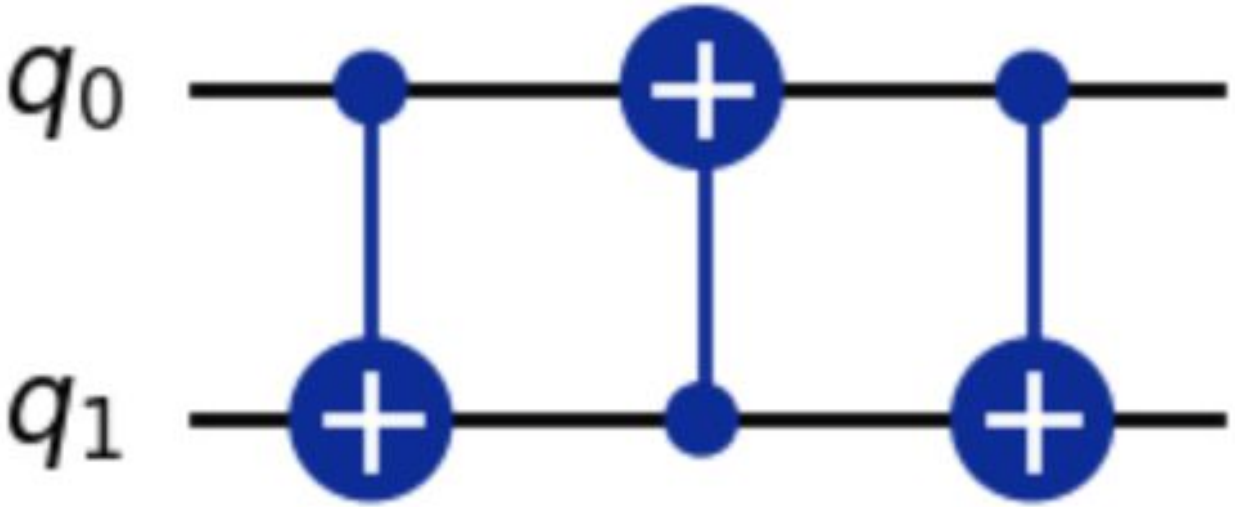
and $\exp(i\theta Z) = Rz(2\theta)$

Q4

Map XX and YY to ZZ through H and T gates as stated in section 4

Q5

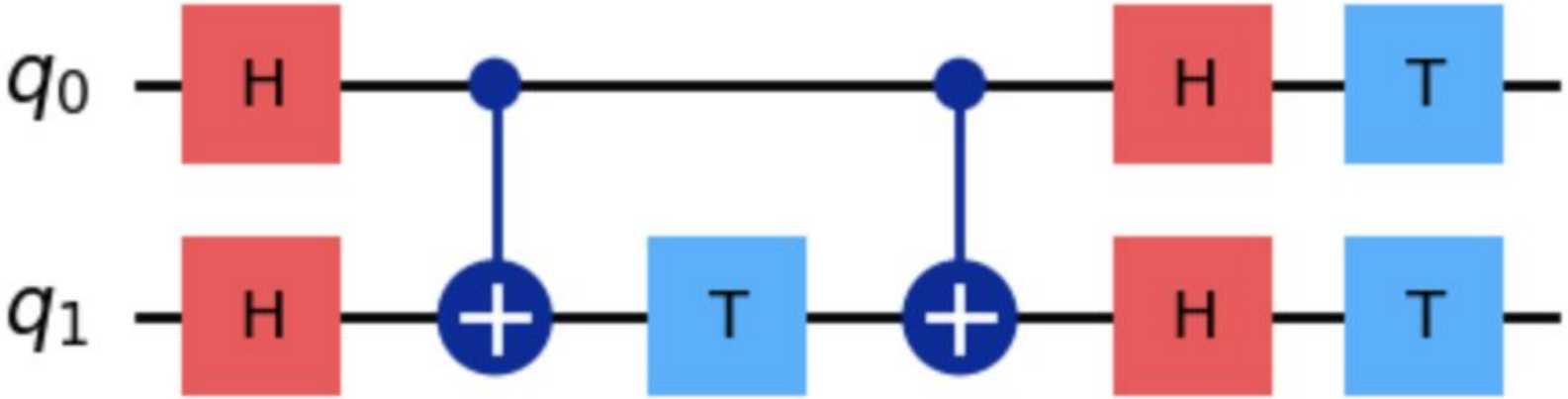
As $XX + YY + ZZ = \exp(i\theta)\, SWAP$



Q6

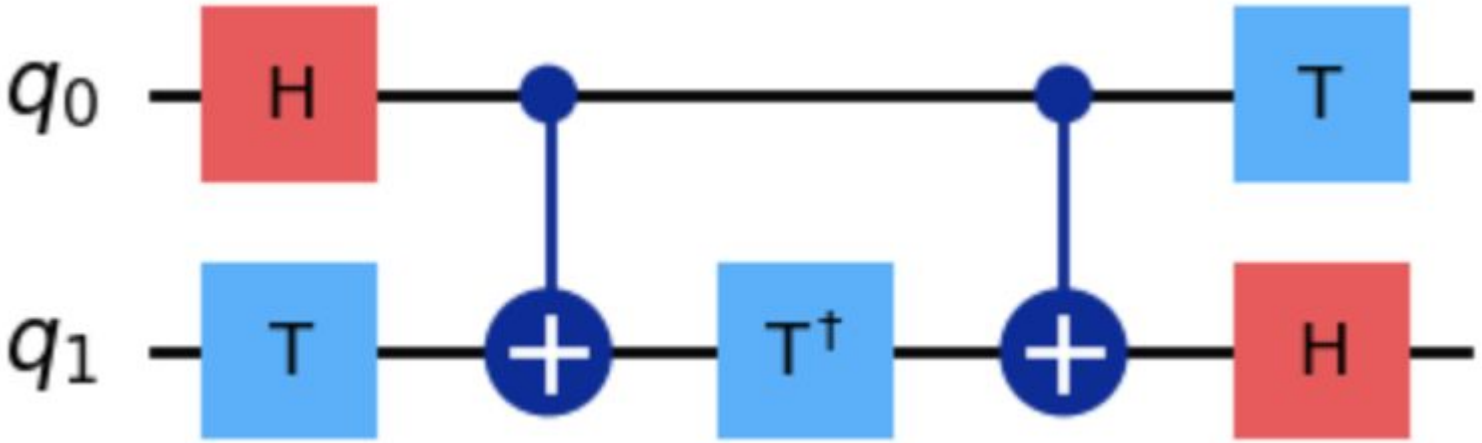
$$HXH = Z \quad ZI = Z \times \hat{I}, IZ = \hat{I} \times Z$$

As Clifford gates preserves pauli groups and both ZI and IZ are just single qubit gate with a phase of pi/7



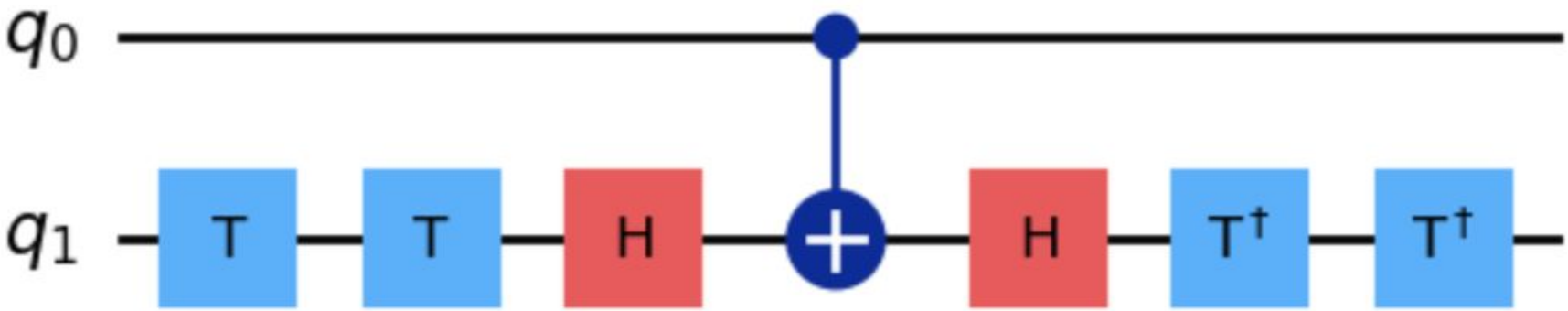
Q8

We noticed quickly that the matrix given is the same as QFT gate



Q9

We ,again, noticed quickly that this is similar to Control-HS gate



Thank you!