

### Inverse QFT

Using Qiskit, implement an inverse Quantum Fourier transform for any general number of qubits.

- Unlike the QFT in the lecture notes, your inverse QFT should not reverse qubit order.
- You must implement the  $R_n$  rotations using only single qubit gates and controlled-NOT gates.

Submit your QFT as an Jupyter notebook, and include some demonstrations that it does what it is supposed to. For this you can use the following function, which creates a circuit that prepares the QFT of the binary representation of a given integer  $j$  on a given quantum register `qr`. Applying your inverse QFT, you should be able to rotate back to the binary representation of  $j$ .

```
def state_prep(j,qr):  
    n = qr.size  
    N = 2**n  
    state = [0]*N  
    for k in range(N):  
        state[k] = np.exp( 1j * 2*np.pi*j*k/N ) / np.sqrt(N)  
    circuit = QuantumCircuit(qr)  
    circuit.initialize(state,qr)  
    return circuit
```