

# OQS Mid-semester exam

September 2024

Full Marks : 50

Time : 1 hour 30 minutes

**Instruction:** For each question, 70% of marks is for mathematical rigor, 20% is for explanation and 10% is for presentation.

1. a) Derive the Kraus representation from the general definition of a completely positive trace preserving map. b) State and prove the trace preserving condition for Kraus operators. (10+10)

2. Show that a completely positive trace preserving map is reversible iff it is unitary. (15)

Prove that transposition is a positive but not completely positive map for three dimensional quantum systems. (15)