Final Exam 03 (10 marks)

10:30 am - 12:00 pm, 03 December 2022 (Saturday)

Course: Quantum Mechanics - 1
Tata Institute of Fundamental Research Hyderabad, India
Instructor: ramakrishnan@tifrh.res.in

Problem 1 (3 marks)

Are the groups SO(3) and SU(2) isomorphic? Explain.

Problem 2 (3 marks)

For a spin-1/2 system, represent the quantum mechanical rotation operator $\mathcal{D}(\alpha, \beta, \gamma) = \mathcal{D}_z(\alpha)\mathcal{D}_y(\beta)\mathcal{D}_z(\gamma)$ in the z-basis.

Problem 3 (4 marks)

Classical euler rotations in the body-fixed frame is given by $\mathcal{R}(\alpha, \beta, \gamma) = \mathcal{R}_{z'}(\gamma)\mathcal{R}_{y'}(\beta)\mathcal{R}_z(\alpha)$. Express the product in the space-fixed frame.
