QCD

zagadnienia do egzaminu

Proszę przygotować jeden problem z gwiazdką i zreferować go na egzaminie. Następnie dwa pytania zostaną wybrane z listy problemów bez gwiazdki.

1. Path integral in quantum mechanics: from Schrödinger equation to partition function.
2. Path integral for scalar field, propagator in momentum space.
3. Grassmann variables, path integral for fermions.
4. Photon propagator in QED, gauge fixing, transverse and longitudinal A_μ fields.
5. *Chiral transformation, anomaly.
6. Atiyah-Singer theorem.
7. Theta term in QCD, topological current, fermion masses and theta term.
8. Instantons in quantum mechanics, treatment of a zero mode.
9. *Instantons in QCD, Bogomolny bound, classical solution, role of the zero modes.
10. *Gauge fixing in QCD and the pertinent Jacobian, Faddeev-Popov ghosts.
11. Chiral symmetry, conserved currents, chiral algebra, inclusion of quark masses.
12. Chiral Ward identities, quark condensate and Goldstone bosons, PCAC.
13. Nonlinear realization of chiral symmetry, Goldstone bosons, chiral lagrangian.
14. Renormalization in QCD, running coupling constant.