Physics 570 Homework 5

Due Wednesday, October 11, 2017

Problem 1 (25 points)

Construct the spin-flavor wave functions, as in Eq. (9.26) of Thomson, for the following hadrons:

(a) $\rho^{\circ}(J_z = 0)$

(b) η

(c) $\Delta^{+}(J_z = -1/2)$

(d) $\Sigma^{-}(J_z = 1/2)$

(e) $\bar{p}(J_z = -1/2)$ (antiproton)

Problem 2 (25 points)

a) What are the quark model predictions for the magnetic dipole moments of the following vector mesons ($J^P = 1^-$)?

$(K^{*+}, K^{*0}, \rho^{+}, \rho^{0}, \rho^{-}, \omega, \bar{K}^{*0}, K^{*-}, \phi)$

Express the results in terms of μ_u, μ_d, μ_s.

b) Find the quark model predictions of the magnetic dipole moment of Σ^0. Also find the $\Sigma^0 \to \Lambda^0$ transition matrix element $< \Lambda^0 \uparrow | \sum_{i=1}^{3} \mu_i (\sigma_z)_i | \Sigma^0 \uparrow >$. Express the results in terms of μ_u, μ_d, μ_s.

Problem 3 (25 points)

Prob. 9.5 of Thomson.

Problem 4 (25 points)

Prob. 9.10 of Thomson.