Problem 1 (25 points)

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

(a) $\rho^0(J_z = 0)$

(b) $\eta$

(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 ($J^P = 1^-$)?

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

Express the results in terms of $\mu_u, \mu_d, \mu_s$.

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

Problem 3 (25 points)

Prob. 9.8 of Thomson.

Problem 4 (25 points)

Prob. 9.9 of Thomson.