Solution for Problem C3

a) (3 points) The $\bar{p}$ is composed of three antiquarks chosen from $\bar{u}$ (charge -2/3) and $\bar{d}$ (charge 1/3). The $\bar{p}$ has charge -1, and so can be only $\bar{u}\bar{u}\bar{d}$. The Σ^+ has an s quark (charge -1/3) and charge +1, so the other two quarks must be u's (with charge 2/3). The Σ^+ is suu. The ρ^- is composed of a quark and antiquark, and has charge -1. It must be $\bar{u}d$.

b) (4 points) The π and ρ mesons are low mass states, so their orbital angular momenta must be S wave (primarily). Given their spins, the quarks in the π meson are in a $^1S_0$ state, and the quarks in the ρ meson are in a $^3S_1$ state.

c) (3 points) The members of an isospin multiplet differ only by the substitution of u for d quarks, and *vice versa*. An isospin 1 multiplet can be constructed only if there are two such quarks. The third quark is the c quark. Given that the c has charge 2/3, the members of the isotriplet have charge 2 (cuu), 1 (cud) and 0 (cdd).