Model independent assignemet.

Let us consider only the helicity (chirality) nonflip term, and let $F_\tau^{V,A}(t)$ be the vector or axial FF of the chirality + state ($\tau = 3$) or chiralty − state ($\tau = 4$). From LFHQCD we have:

$$F_\tau^V(t) = 1/N_\tau B[\tau - 1, 1/2 - t/(4\lambda)], F_\tau^A(t) = 1/N_\tau B[\tau - 1, 1 - t/(4\lambda)]$$

Assuming an univeral w for each trajecxory, we have

$$F_\tau^V(t) = 1/N_\tau \int_0^1 dx\, w_V(x)^{-1/2-t/(4\lambda)}(1 - w_V(x))^{\tau-2} w_V'(x)$$

and

$$F_\tau^A(t) = 1/N_\tau \int_0^1 dx\, w_A(x)^{-t/(4\lambda)}(1 - w_A(x))^{\tau-2} w_A'(x)$$

More generally one may assume $w_V(x) = w_A(x)$.

Be $P_{q,\pm}$ the probability to have the quark q in the chirality $\pm$ wave function (we ignore the s-quark and hence the Cabbibo mixing)

Then we have:

For the e.m. FF of the proton:

$$eF_{em}(t) = e[(P_{u,+}\frac{2}{3} + P_{d,+}\frac{-1}{3})F_3^V(t) + (P_{u,-}\frac{2}{3} + P_{d,-}\frac{-1}{3})F_4^V(t)]$$

For the charged weak vector current of the proton ($p + e^- \to n + \nu$):

$$\frac{g}{\sqrt{8}} F_{cc}^V(t) = \frac{g}{\sqrt{8}}[(P_{u,+})F_3^V(t) + (P_{u,-})F_4^V(t)]$$

For the charged weak axial current of the proton ($p + e^- \to n + \nu$):

$$\frac{g}{\sqrt{8}} F_{cc}^A(t) = \frac{g}{\sqrt{8}}[(P_{u,+})F_3^A(t) - (P_{u,-})F_4^A(t)]$$

For the neutral vector current of the proton ($p + \nu \to p' + \nu'$):

$$\frac{g}{2\cos\theta_W} F_{nc}^V(t) = \frac{g}{2\cos\theta_W}[(P_{u,+}g_V^u + P_{d,+}g_V^d)F_3^V(t) + (P_{u,-}g_V^u + P_{d,-}g_V^d)F_4^V(t)]$$

For the neutral axial current of the proton ($p + \nu \to p' + \nu'$):

$$\frac{g}{2\cos\theta_W} F_{nc}^A(t) = \frac{g}{2\cos\theta_W}[(P_{u,+}g_A^u + P_{d,+}g_A^d)F_3^A(t) + (P_{u,-}g_A^u + P_{d,-}g_A^d)F_4^A(t)]$$

where (see e.g. PDG 10.5)

$$g_V^u = \frac{1}{2} - \frac{4}{3}\sin\theta_W; \quad g_V^d = -\frac{1}{2} + \frac{2}{3}\sin\theta_W;$$

$$g_A^u = \frac{1}{2} \quad g_A^d = -\frac{1}{2}$$

For $SU(6)$ wave functions, we have the values given by Guy.