e is distributed according to the PDF

$$f(e) = x(e)^{a-1}(1 - x(e))^{b-1} \tag{1}$$

where

$$x(e) = \frac{1}{2}\left[1 + \frac{e}{\bar{e}}\right] \tag{2}$$

We want

$$I_k(\widetilde{m}) = \int_{\alpha}^{\beta} q^k f(\tilde{m} - q)dq \tag{3}$$

$$= \int_{\alpha}^{\beta} q^k x(\tilde{m} - q)^{a-1}(1 - x(\tilde{m} - q))^{b-1}dq \tag{4}$$

$$\tag{5}$$