(6)

$$g_B^E = X_A^2 \sum_{n=0} b_n X_B^n = \left(g^E + X_A \frac{dg^E}{dX_B}\right)$$

$$= X_A X_B \sum_{n=0} q_n X_B^n + X_A \frac{d}{dX_B}\left[\sum_0 q_n X_B^{n+1} - \sum q_n X_B^{n+2}\right]$$

$$(1-X_B)X_A \sum b_n X_B^n = X_A \sum q_n X_B^{n+1} + X_A\left[\sum_0 (n+1) q_n X_B^n - \sum_0 (n+2) q_n X_B^{n+1}\right]$$

$$X_A\left[\sum_0 b_n X_B^n - \sum_0 b_n X_B^{n+1}\right] = X_A\left[\sum_0 q_n X_B^{n+1} + \sum_0 (n+1) q_n X_B^n - \sum_0 (n+2) q_n X_B^{n+1}\right]$$

$$\sum_0 b_n X_B^n - \sum_1 b_{n-1} X_B^n = \sum_1 q_{n-1} X_B^n + \sum_0 (n+1) q_n X_B^n - \sum_1 (n+1) q_{n-1} X_B^n$$

$$\sum_0 (b_n - b_{n-1}) X_B^n = \sum_0 \left((n+1) q_n - n q_{n-1}\right) X_B^n$$

(Let $b_{-1} = q_{-1} = 0$)

$$(b_n - b_{n-1}) = (n+1) q_n - n q_{n-1}$$

$$\boxed{b_n = (n+1) q_n}$$

Also: $a_n = (n+1)(q_n - q_{n+1})$

$a_n = b_n - \left(\frac{n+1}{n+2}\right) \cdot b_{n+1}$