

$$f(L) = z^{-1} u(L)$$

$$f(z) = \frac{1}{1-2z^{-1}}$$

$$g(L) = 3z^{-1} u(L)$$

$$g(z) = \frac{3z^{-1}}{(1-3z^{-1})^2}$$

$$y(z) = \frac{1}{(1-2z^{-1})} \frac{3z^{-1}}{(1-3z^{-1})^2}$$

$$= \frac{A}{(1-2z^{-1})} + \frac{B}{(1-3z^{-1})} + \frac{C}{(1-3z^{-1})^2}$$

$$A = \frac{3z^{-1}}{(1-3z^{-1})^2} \Big|_{z^{-1}=1/2} = \frac{3 \cdot 1/2}{(1-3/2)^2} = \frac{3/2}{1/4} = \boxed{6 = A}$$

$$C = \frac{3z^{-1}}{1-2z^{-1}} \Big|_{z^{-1}=1/3} = \frac{3 \cdot 1/3}{1-2/3} = \boxed{3 = C}$$

$$y(z) = \frac{6}{(1-2z^{-1})} + \frac{B}{(1-3z^{-1})} + \frac{3}{(1-3z^{-1})^2}$$

Terms independent

$$6 + B + 3 = 0 \quad \boxed{B = -9}$$

$$y(z) = \frac{6}{(1-2z^{-1})} + \frac{-9}{(1-3z^{-1})} + \frac{3}{(1-3z^{-1})^2}$$

$$\frac{1}{(1-3z^{-1})^2} = \frac{1-3z^{-1}+3z^{-1}}{(1-3z^{-1})^2} = \frac{1}{(1-3z^{-1})} + \frac{3z^{-1}}{(1-3z^{-1})^2}$$

$$y(z) = \frac{6}{(1-2z^{-1})} + \frac{1}{(1-3z^{-1})} \left(-9 + 3 \right) + \frac{9z^{-1}}{(1-3z^{-1})^2}$$

$$\mathcal{Z}^{-1} \left(y(z) \right) = [6z^k - 6z^k + 3z^k] u[k]$$