

Hence the general solution is

$$Y_k = (C_1 + C_2 k + C_3 k^2) (1)^k + \frac{3}{2} k^3 \quad \text{Ans.}$$

• Type - II:

When the right hand side of the non-homogeneous difference eq. has the form as,

$$f(x) = \beta \alpha^x$$

where  $\alpha, \beta$  are constants, then in order to find particular solution substitute  $y_x = c \alpha^x$  and evaluate the value of  $c$ .

Questions:

Q1.  $y_{x+3} - y_{x+2} + y_{x+1} - y_x = 3^x \quad \text{--- ①}$

Sol. Consider the homogeneous difference equation corresponding to eqn ① which is

$$y_{x+3} - y_{x+2} + y_{x+1} - y_x = 0 \quad \text{--- ②}$$

Let  $y_x = Ab^x$  be non-trivial solution of ② so, it must satisfy it.  
i.e.

$$Ab^{x+3} - Ab^{x+2} + Ab^{x+1} - Ab^x = 0$$

$$\Rightarrow b^3 - b^2 + b - 1 = 0 \quad \because Ab^x \neq 0$$

$$b^2(b-1) + b-1 = 0$$

$$b^2 + 1 = 0, \quad b-1 = 0$$

$$b = \pm i, \quad b = 1$$