Q1. Find the coefficient of x^4 in the expansion of $(1 + x + x^2 + x^3)^{11}$.

Sol. Given expression is $(1 + x + x^2 + x^3)^{11}$

$= [(1 + x) + x^2(1 + x)]^{11} = [(1 + x)(1 + x^2)]^{11} = (1 + x)^{11} \cdot (1 + x^2)^{11}$

$= (^{11}C_0 + {}^{11}C_1x + {}^{11}C_2x^2 + {}^{11}C_3x^3 + {}^{11}C_4x^4 + \ldots)(^{11}C_0 + {}^{11}C_1x^2 + {}^{11}C_2x^4 + \ldots)$

$\therefore$ Coefficient of $x^4 = {}^{11}C_0 \times {}^{11}C_4 + {}^{11}C_1 \times {}^{11}C_2 + {}^{11}C_2 \times {}^{11}C_0$

$= 330 + 605 + 55 = 990$