Enzymatic reaction rate: $r_p = k_3[KS]$ (I)

Since the initial concentration of E is the sum of the concentration of free E and the concentration of ES, that is: $[E_0] = [E] + [ES]$ (II)

If the catalytic rate k_3 is large, the ES complex will convert very quickly once it has been generated. At this point, it can be approximated that the ES is maintained at a lower concentration and remains essentially constant. Therefore, using the classical steady-state assumption in physicochemical kinetics, i.e. the ES production and elimination reach a dynamic equilibrium equation, therefore: $k_1[E][S] = k_2[ES] + k_3[ES]$ (III)

It can be seen from (III): $[E] = \frac{k_2+k_3}{k_1[S]} * [ES]$ (IV)

It can be seen from (II) and (IV): $[E_0] = \frac{k_2+k_3+k_1[S]}{k_1[s]} * [ES]$

Therefore: $[ES] = \frac{k_1[E_0][s]}{k_2+k_3+k_1[S]}$ (V)

It can be seen from (I) and (V): $r_p = \frac{k_1 k_3[E_0][s]}{k_2+k_3+k_1[S]}$