4. Numerical simulations

The application of the new control method presented in this paper is illustrated in this section. An idealized three Degree-of-Freedom (DOF) structure model proposed by Yang (1995) in Figure 3 is used to study thoroughly the feasibility of the new control method. The 3DOF structure is counteracted by an active brace system (ABS) implemented on the first storey unit. The mass, stiffness and damping coefficient of each storey unit are m_i=1 metric ton, $k_i = 980$ kN/m , and $C_i = 1.407$ kN.s/m , respectively(i=1-3) .The N-S component of the 1940 EI Centro earthquake record scaled to a maximum ground acceleration of 0.35g is used as the input excitation, and its episode is taken to 8s. The sampling period is given by $T = 0.02$s. The coefficient q in Equation (10) is chosen as $q=10$. In this paper, the LQR method is used for determining the coefficient matrix Θ of the switching surface.

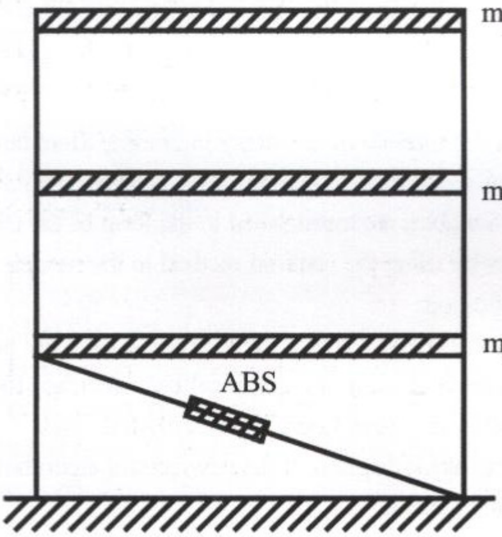

Fig. 3. Schematic diagram of 3DOF model Structure with control device.

When the value of the " ε "parameter is changed, the control time histories for DVSC system involving exponential reaching law is presented in Figure 4. In Figure 4, the control time histories for DVSC system involving exponential reaching law are denoted by "Exponential RL". We vary the values of the " ε " parameter from 0.3 to 1.0.

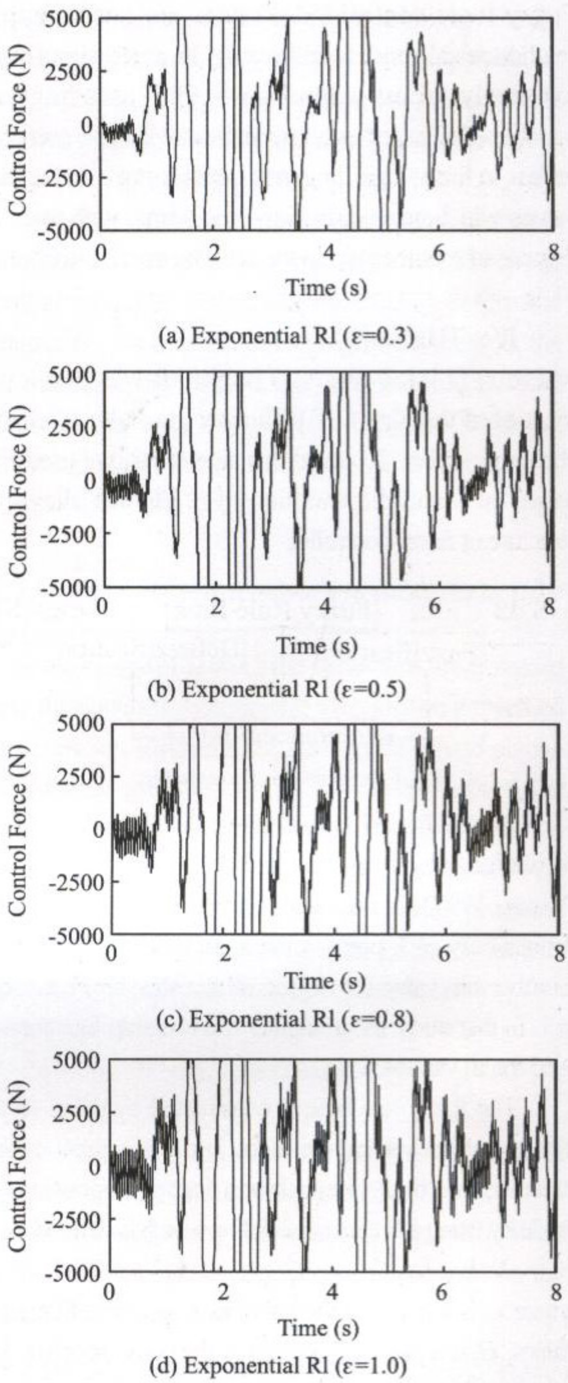

Fig. 4. Control force time histories involving exponential reaching law.

From Figure 4, we can see clearly excessive chattering effect, the major disadvantage of DVSC method involving exponential reaching law, when the " ε " parameter becomes a bigger value.

However, it can efficiently remove the undue chattering effect to use the DVSC method involving fuzzy adaptive regulation of reaching law. After we