ABSTRACT

The prime objective of this thesis is to investigate the dynamics of blocky rock mass subjected to ground motion. It starts with the survey of existing classification of rocks and the assessment of strength of a blocky rock mass as a whole. The response of an isolated rock mass on a horizontal and an inclined plane subjected to harmonic ground motion are classified into different modes. These are the main building blocks. Since the problem is dynamic, it is imperative to have a deeper understanding of the nature of static and dynamic friction between blocks. Infact static and dynamic friction parameters are quite different in magnitude and character. They profoundly influence the motion of rocks, especially in the stick-slip mode. In this investigation a micro-mechanical theory has been developed to explain the transient character of this phenomenon.

In order to appreciate the practical nature of the problem and place the scope of the thesis in proper perspective classical aspects of rock classification in the light of structural geology is first discussed. The present work falls under the class 1 of Geological Strength Index (GSI) i.e. ‘blocky rock mass’ and its extension, to ‘very blocky rock mass’. In the whole investigation roughness of rock surfaces plays an important role. Hence the fractal characters and classical JRC levels have been reviewed briefly.

All these analyses are necessary in order to prepare a background for ensuing dynamic stability of rock mass system. In practical application blocky rock mass is often encountered at the turns of a hilly road and has been experimentally and numerically investigated in this thesis. Through out the later part of the thesis attention has been restricted to practical application and statistical inference as applied to rockslide, rather than keeping track of interaction between individual blocks and their motion.

In most cases proposed theory and numerical simulations are supplemented with experiments.