1. A 18 m high rock cut for a road has a dip of 60° toward 166°. Field mapping determines the presence of five joint sets with following orientations (dip/dip direction).

72°/120°

54°/110°

58°/240°

48°/340°

60°/350°

a) Plot the data on a stereonet and carefully label all features.

b) Will any of these joint sets potentially cause a planar sliding failure mode in the rock cut? Provide your rationale.

c) Which joint set combination can potentially create a wedge sliding failure mode? Answer this by calculating the FS for all kinematically possible wedges assuming all joints are dry and c = 0 and friction angle = 26°. Use a table for your submission – no figures.

2. A rock block sits on an inclined surface (ψ= 30 degrees) with tension crack filled up with water as shown below (per metre into the page). The block density is 2500 kg/m3.

a) Determine the magnitude of the forces V and U.

b) Calculate the factor of safety assuming that no cohesion on the sliding surfaces and the friction angle = 35 degrees

c) For the same block, determine the factor of safety if there is also an effective cohesion of 80 kPa between the block and the inclined slip surface in addition to the friction angle.

d) Assuming there is no cohesion between the block and the inclined slip surface. An active bolt with pretension needs to be used to achieve the factor of safety of 1.5. Determine the bolting angle and draw on a sketch. Determine the pretention force F for the bolt.