B.E. VIth Semester Examination 2012

Mining Engineering

MN 601: Rock Mechanics Applications

Full Marks: 70 **Time: 3 hours**

Answer any five questions

1.a) Two flatjack measurements were made on the top and side of a circular tunnel. The stress measured on the top flatjack was 6.00MPa and the side one recorded a stress of 17.35MPa. Calculate the horizontal and vertical stresses.

b) A hydraulic fracturing experiment was conducted at a depth of 1500 m. The peak pressure reached was 6.36 MPa above the hydraulic pressure and it dropped to a steady value of 0.96MPa above the hydraulic pressure following which the fluid pressure was withdrawn. On application of pressure again the fluid pressure was raised to 2.21 MPa above the shut in pressure. Calculate the in situ stresses.

(7+7)

2. A circular tunnel is to be constructed at a depth of 200 meters where the average density of the overlying rock is 2.2 tons/m^3 and the Poisson's ratio is 0.45. Calculate and plot the tangential boundary stress concentrations from 0 $^\circ$ to 90 $^\circ$ at an increment of 15 $^\circ$. (14)

3. a) Show that i) radial boundary stresses do not exist ii) tensile boundary stress develops at the top of a circular excavation and iii) in a hydrostatic stress field boundary stress concentration is invariant.

b) Explain the USBM overcoring system of in situ stress determination. (7+7)

4. a) What are the different types of curvilinear slip may take place?

b) Explain 'wedge failure' of a bench in opencast mine.

c) Explain the direct and flexural toppling failure situations. (3+4+7)

5. A planar discontinuity lying 35° to horizontal is exposed on a quarry face of slope angle 60°and height 20 m. A dry vertical tension crack intercepts the discontinuity at a depth of 10 meters from the top of the bench. If cohesion is 50 KPa, angle of friction is 30° and unit weight of rock is 2.2 ton/m^3, calculate the factor of safety. (14)

6. a) Explain the concept of 'sub-critical', 'critical' and 'supercritical' width in relation to surface subsidence

b) Draw a subsidence profile of a flat seam and show the profile of other important components of subsidence. (6+8)

7. Write short notes on:

a) Multipoint extensometer c) Finite element method d) Rock burst d) Anderson stress classification

(3+4+3+4)