

GUJARAT TECHNOLOGICAL UNIVERSITY
M. E. - SEMESTER – III • EXAMINATION – WINTER • 2013

Subject code: 734302**Date: 28-11-2013****Subject Name: Rock Opening and Tunnels****Time: 10:30 am – 13:00 pm****Total Marks: 70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

- Q.1** (a) Explain in detail purpose of geological exploration for tunnel construction. **07**
- (b) Enlist classification of Traffic tunnels and explain each one in detail with neat sketch. **07**

- Q.2** State classification of intact rock. Describe various index properties of rock in detail. Also summarize the tests carried out to determine each property. **14**

- Q.3** (a) State modes of rock failure and explain each in detail. Define 'rock strength' and explain 'Mohr-Coulomb' failure criterion. **07**
- (b) Elaborate allowable bearing pressure on footings on rock. Explain with plot of σ_v vs σ_h and Goodman bearing capacity analysis for sandstone. Explain criteria for placing footing on layered rock and rock with open joints. **10**

OR

- Q.3** (a) Explain the importance of 'friction' on rock surfaces. Give various configurations used for measuring friction in triaxial testing machine. State 'Byerlee's' law. **07**
- (b) Justify in detail Coulomb-Navier theory of failure with necessary equations. **07**
- Q.4** (a) State various methods to determine absolute stress in rock. Explain Borehole deformation method with deformation rosette. **07**
- (b) Explain fundamental difference between Coulomb-Navier and Mohr's theory of failure. How Griffith's theory of brittle fracture is found to be more better in predicting failure, state the criteria's given by him. **07**

OR

- Q.4** (a) Describe with neat sketch 'triaxial compression test' on rock. State its limitations. **07**
- Q.4** (b) Explain assumptions made for openings in massive rock for three-dimensional case. For a case of two circular openings explain the importance of ratio W_o/W_p when $\sigma_v = \sigma_h$ and $\sigma_v \neq \sigma_h$, $\sigma_h = 0$. **07**
- Q.5** (a) State various principal conclusions useful in the design of multiple opening separated by rib pillars for 2-D case. Why aerial extraction ratio is kept less than 0.75? **07**
- (b) Write detail note on rock bolting and rock grouting with neat sketch. Justify your answer with at least one field application for rock bolting in India. **07**

OR

- Q.5** (a) Define pillars. Explain aerial extraction ratio. Explain vertical and horizontal stress distribution pattern in case of limestone pillar and lead ore pillar. What are your inferences for both cases? **07**
- (b) Define rib pillars. Explain in detail various factors affecting compressive strength of rib pillar with necessary equations. **07**