Seat No.: _____ Enrolment No._____

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 footing s on rock. Explain with plot Raphael 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 Wo/Wp when Sv=Sh and Sv≠Sh, Sh = 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 areal 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**

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