



End Semester/Reappear (Semester IV) Examination May 2025

Programme: B. Tech (MiE)

Course: Elements of Rock Mechanics

Course Code:8PCCMiE304

Full Marks: 70

Time: 3 Hrs.

Enrolment no. _____

Q.N o.	Questions	CO	Bloom Taxonomy Category	Marks
Section I				
1	Short Answer type questions.			4 x 5 = 20
a	Explain the stress-strain curve with suitable diagram.	CO1	Remember	
	or			
b	"Define the concepts of bulk modulus and modulus of rigidity, including their significance and applications.	CO1	Remember	
	When the hanging wall side appears to have moved relatively downwards in comparison with the adjoining footwall side, what type of fault will induce? Explain with a suitable diagram.	CO2	Analyze	
	or			
c	Distinguish the different types of constant used in stress analysis.	CO2	Remember	
	Write down detailed and complete Stress Analysis in Plane Stress also formulate the relation between stresses (2-Dimensional) condition.	CO3	Understand	
	or			
d	Discuss about Mohr circle and state the importance of Mohr circle.	CO3	Understand	
	Explain permeability of rocks. Write down the experimental determination of permeability of rocks methods.	CO4	Understand	
	or			
	Define the deformability and creep of rock.	CO4	Remember	
Section II				
	Long Answer type questions.			3 x 10 = 30
2	Discuss about the scalar, vector, and tensor in brief with suitable examples.	CO1	Understand	
	or			
3	Explain the different strength parameters of rock and discuss the key factors that influence its strength."	CO1	Analyze	
	Strata control monitoring plan which is known as SCAMP, why DGMS has introduces it in the underground mining and how it is being followed in the real mining scenario.	CO2	Analyze	
	or			
4	Explain the Stress Strain relationship of an elastic material or Hooke's law for one dimensional loading condition.	CO2	Understand	
	Discuss the Hoek- Brown Criteria also explain the hoek – brown criteria in principle plane: Two dimensions.	CO3	Analyze	
	or			

	Discuss the Geological strength index and also formulate the Rock mass quality with reference to GSI value.	CO3	Analyze	
Section III				
	Application based questions			
5	A circular tunnel with a radius of 3 meters is built within a hydrostatic stress field of 15 MPa. The surrounding rock has a modulus of elasticity of 5 GPa and a Poisson's ratio of 0.25. To limit radial deformation at the tunnel boundary to 4 mm, a uniform support pressure P_i is applied to the boundary. Determine the value of P_i required to achieve this restriction.	CO4	Analyze	1 x 20 = 20
	or			
	A coal seam with a thickness of 2.5 meters is situated at an average depth of 100 meters and has been developed using the bord and pillar method. The square-shaped pillars are spaced 30 meters apart (center-to-center), with a gallery width of 4 meters . The overlying strata have an average density of 26 kN/m³ , and the pillar strength is 4500 kN/m² . Compute the factor of safety and the extraction ratio during pillar development.	CO4	Evaluate	

COURSE OUTCOME

CO1 Understand the basic knowledge of rock mechanics for understanding, formulating and solving strata control problem in any underground mine.

CO2 Explain the various physico mechanical properties of rock in respect to mining.

CO3 Acquire knowledge and hands-on competence in applying the concepts of rock failure theories.

CO4 Evaluate the dynamic properties of rock, creep theory and rock mass by various Laboratory test & in situ test.