Roll No. | | | | | | | | | | |

ANNA UNIVERSITY (UNIVERSITY DEPARTMENTS)

B.E. /B.Tech / B. Arch (Full Time) - ARREAR EXAMINATIONS, ~~June~~ April/May 2024

Mining Engineering

Fifth Semester

MI 5503 – Rock Mechanics and Ground Control

(Regulation 2019)

Time: 3 hrs Max.Marks: 100

CO1	To study about application of Rock Mechanics in mining and allied engineering
CO2	To study about Physico-Mechanical properties of rocks
CO3	To study about non-destructive testing methods
CO4	To study about time dependent properties of rock
CO5	To study different types of underground supports

BL – Bloom's Taxonomy Levels

(L1-Remembering, L2-Understanding, L3-Applying, L4-Analysing, L5-Evaluating, L6-Creating)

PART- A (10 x 2 = 20 Marks)

Q.No	Questions	Marks	CO	BL
1	What is modulus of elasticity of a material?	2	1	L3
2	What are major and minor principal stresses?	2	1	L3
3	How is point load index related to unconfined compressive strength?	2	2	L3
4	What is bulk modulus?	2	2	L3
5	What are the various test methods for tensile strength?			
6	What is Poisson's ratio?	2	3	L3
7	Explain time dependent property of a rock.	2	4	L2
8	Explain dynamic viscosity for rocks.	2	4	L4
9	What are Longwall powered supports?	2	5	L1
10	What are the various types of steel supports used?	2	5	L1

PART- B (5 x 13 = 65 Marks)

Q.No	Questions	Marks	CO	BL
11 (a)	A plane stress system has the following values: σ_x = +40 Mpa σ_y = -5 Mpa and τ_{xy} = +30 Mpa. Determine principal planes, principal stresses, maximum shearing stress, its direction and the corresponding normal stress.	13	1	L3
	OR			
11 (b)	For the following system of stresses, Tensile stresses of 90 Mpa and 55 Mpa in the x and y directions and shear stress of 30 Mpa	13	1	L3

	clockwise direction, estimate: Principal planes and principal stresses and the stress components exerted on the element by rotating the given element counter clockwise through 40^0.			
12 (a) (i)	Explain the principles of hydraulic permeability and conductivity.	7	2	L3
(ii)	How is sonic velocity used as an index to the degree of fissuring?	6	2	L3
	OR			
12 (b)	Compare and explain the Geo mechanics and Q system of classification for rock masses.	13	2	L3
13 (a)	With neat diagrams explain test procedures to estimate the tensile strength and unconfined compressive strength of rocks.	13	3	L2
	OR			
13 (b)	What are index properties of rocks? Explain the basis for the development of this system.	13	3	L2
14 (a)	What are linear visco elastic models? How are visco elastic constants determined from laboratory tests?	13	4	L2
	OR			
14 (b)	Explain the mechanisms used to explain creep in a rock mass	13	5	L1
15 (a)	With neat diagrams, explain the usage of timber as a mine support. (Answer with reference to setting a prop, underset prop, yielding steel prop with timber core, setting it along a roof, setting along an inclined roadway) Explain the setting of these supports for various gallery heights.	13	5	L2
	OR			
15 (b)	What are self advancing/walking supports? Explain their construction and working. (4 leg 6 leg canopy supports (chock and chock shield supports)) How are they installed along a Longwall face? (Answer should include supports available till date for the 8m/9m high Longwall faces)	13	5	L2

PART- C (1 x 15 = 15 Marks)

Q.No	Questions	Marks	CO	BL
16.	For a plane stress system with the following values: σ_x = +40 Mpa σ_y = 25 Mpa and τ_{xy} = +10 Mpa, determine principal planes, principal stresses, maximum shearing stress, its direction and the corresponding normal stress using Mohr's circle. (use a graph sheet)	15	1	L3