Roll No.

ANNA UNIVERSITY (UNIVERSITY DEPARTMENTS)

B.E. / B. Tech / B. Arch (Full Time) - END SEMESTER EXAMINATIONS, APRIL / MAY 2025

MINING ENGINEERING
Sixth Semester
MI5001 – Applied Rock Engineering (RMGC-II)
(Regulation 2019)

Time: 3hrs   Max.Marks: 100

CO 1	Acquire the knowledge on rock mechanics instrumentation
CO 2	Learn about pit slope stability, theories of subsidence
CO 3	Understand the theories of failure of rocks, rock burst and pillar design
CO 4	Explore about design of underground openings and numerical methods of geo-mechanics
CO 5	Learn about methods of stowing

BL – Bloom's Taxonomy Levels
(L1 - Remembering, L2 - Understanding, L3 - Applying, L4 - Analysing, L5 - Evaluating, L6 - Creating)

PART- A (10 x 2 = 20 Marks)
(Answer all Questions)

Q. No	Questions	Marks	CO	BL
1	Explain the term 'LVDT'.	2	CO1	L1
2	List out any four in-situ measurement instrumentation.	2	CO1	L2
3	Draw a nomenclature of subsidence for NEW, sub-critical, critical and super-critical width and label all the features from underground working to surface.	2	CO2	L3
4	What do you mean by strength reduction factor in slope stability?	2	CO2	L4
5	Write short notes on Hoek Brown theory of failure of rocks.	2	CO3	L3
6	Illustrate the influencing factors of rock burst.	2	CO3	L4
7	Classify the types of numerical modelling.	2	CO4	L3
8	Elaborate the significance of effective stress in engineering design.	2	CO4	L3
9	State the limitations of gravity stowing.	2	CO5	L1
10	Mention the reasons for popularity of hydraulic sand stowing in Indian coalfields.	2	CO5	L2

PART- B (5 x 13 = 65 Marks)
(Restrict to a maximum of 2 subdivisions)

Q. No	Questions	Marks	CO	BL
11 (a)	Explain the salient features of extensometer and different types of extensometer based on scope of field application in surface and underground mines.	13	CO1	L2
	OR			
11 (b)	Describe the experimental application of strain gauge and load cell in rock testing laboratory with constructional features and working principles.	13	CO1	L2
12 (a)	Elaborate the factors influencing the surface deformation with reference to the underground workings with neat sketches. Also, discuss the procedure to determine empirical equation in terms of subsidence factor.	13	CO2	L3
	OR			

12 (b)	Describe the procedure to increase the depth of working from the existing depth of 60m as per MMR and DGMS guidelines with neat pit design. Also, explain the various geotechnical instrumentation applicable in slope stability monitoring system with principles of working, salient features with the help of neat sketches.	13	CO2	L3
13 (a)	Discuss in detail of failure criterion of rock with neat derivations and sketches for Mohr-Coulomb failure envelope.	13	CO3	L3
OR				
13 (b)	Discuss in detail of effect of confining pressures on rocks in relation with Brittle-Ductile transition criteria with neat graphs.	13	CO3	L3
14 (a)	Explain in detail of experimental procedure to analyse the hydraulic stowing of pond ash in underground coal mines using scale model studies with neat diagrams.	13	CO4	L3
OR				
14 (b)	Explain the stress distribution for retreating longwall panel with dimension of 1500m length and 150m width from boundary to crown pillar of panel with neat sketches.	13	CO4	L3
15 (a)	Explain in detail method of extraction, transportation and storage arrangement of stowing material in surface of a coal mine with the neat sketches.	13	CO5	L2
OR				
15 (b)	Give layouts of depillaring district in conjunction with hydraulic sand stowing of a coal seam for different seam conditions as flat seam, inclined seam and steep seam. The answer should include the underground and face arrangements for stowing panels.	13	CO5	L2

PART- C (1 x 15 = 15 Marks)
(Q.No.16 is compulsory)

Q. No	Questions	Marks	CO	BL
16.	Design systematic support system for gallery and junction of Bord and Pillar development panel in coal seam of thickness 12m seated in the depth of 130m with gradient 1 in 6. Also, determine the pillar and gallery dimensions as per CMR 2017, strength of pillar, recovery (%), load acting on the pillar and factor of safety using compressive strength of coal sample is 23.8 MPa, dry density of rock is 2.3 t/m^3, rock mass rating of 41. Assume any missing data, justify the same.	15	CO3	L5