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

ANNA UNIVERSITY (UNIVERSITY DEPARTMENTS)

B.E. / B. Tech / B. Arch (Full Time) - END SEMESTER EXAMINATIONS, APRIL / MAY 2024

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	Illustrate the scope of field applications of extensometer.	2	CO1	L1
2	Depict the working principles of load cell.	2	CO1	L2
3	Define angle of draw. Mention the various types of angle of draw based on dip orientation.	2	CO2	L3
4	Elaborate the statutory provisional for slope stability analysis of mine.	2	CO2	L4
5	Mention the significance of empirical criteria and justify with expressions.	2	CO3	L3
6	Determine the rock load for a gallery width of 4.8m, height of 2.5m lying at a depth of 300m from the surface. Assume any missing data.	2	CO3	L4
7	Write short notes on tributary area approach for pillar stress and load distribution.	2	CO4	L3
8	Explain the term 'rheology'.	2	CO4	L3
9	State the laboratory procedures to determine the shrinkage characteristics of stowing materials.	2	CO5	L1
10	What do you mean by pulp density for stowing materials?	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)	Describe the scope of field applications, advantages and working principles of convergence indicators with neat sketches.	13	CO1	L2
	OR			
11 (b)	Describe the scope of applications, advantages and working principles of flat jacks with neat sketches.	13	CO1	L2
12 (a)	Explain the factors affecting subsidence occurrence on surface during the working underground coal working panel. Describe briefly various prediction techniques of subsidence in order to quantify the horizontal and vertical displacement of ground surface.	13	CO2	L3

	OR			
12 (b)	Discuss in detail of various geotechnical instrumentation applicable in slope stability monitoring system with scope of application, principles of working, salient features with the help of neat sketches; also indicate the slope stabilization techniques can be deployed for different site conditions. Prepare a TARP plan for an opencast mine with the production capacity of 1.8 MTPA.	**13**	CO2	L3
13 (a)	Describe the various theories of failure criteria and indicate the significant influence parameters on rock strength. Discuss in detail of Mohr-Coulomb failure criterion of rock with neat derivations and sketches.	**13**	CO3	L3
	OR			
13 (b)	Discuss in detail of causes and mechanism of coal bump occurrence, also highlight the bump detection and prevention methods for bump occurrence with neat sketches	**13**	CO3	L3
14 (a)	Explain in detail of scale model studies of strata movement around mine roadways with the help of neat diagrams.	**13**	CO4	L3
	OR			
14 (b)	Explain the procedure for numerical modelling of underground circular opening to analyze the stress distribution and draw the flowchart in order to detail the methodology to be adopted for the finite element modelling.	**13**	CO4	L3
15 (a)	Explain in detail working principles and operational procedure of the gravity stowing method with the neat sketches.	**13**	CO5	L2
	OR			
15 (b)	Describe the preparatory face arrangements before starting the stowing operation at the goaf of longwall panels with the neat layouts.	**13**	CO5	L2

PART- C (1 x 15 = 15 Marks)

(Q.No.16 is compulsory)

Q. No	Questions	Marks	CO	BL
16.	Determine the strength of pillar, load acting on the pillar and factor of safety using (a) Salamon's expression (b) Holland's expression and (c) Sheorey's formula for the following data of Bord and Pillar panel. Assume any missing data. i. Compressive strength of 25mm cubic coal sample is 35 MPa ii. Maximum depth of panel is 300m iii. Height of the gallery is 3m iv. Width of the gallery is 4.8m v. Size of the pillar is 25m vi. Density of rock above the coal seam is 2500 kg/m^3	**15**	CO3	L5