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MINE SURVEYING II

UNIT 1: THEODOLITE SURVEYING

Types of Theodolites; Description of various parts of a Vernier Theodolite; Requirements of Mining type Theodolites; Measurements of height and distances of accessible and inaccessible points; Traversing with Theodolite on surface and underground; Checks on Closed and Open traverses; Balancing of traverses; Temporary & Permanent adjustments of Theodolites; Sources of errors and their prevention.

UNIT 2: TACHEOMETRY

Principles of Stadia Methods; Determination of constants; Theory of anallactic lens; Distance and elevation formulae, Sub tense and Tangential Methods; Auto- Reduction Tacheometer.

UNIT 3: SETTING OUT

Setting out simple curves on surface and in underground; Elementary knowledge of compound and transition curves; joint boundary survey; Equalization of boundaries; Maintenance of direction and radiant of roadways i.e. marking and checking of center line and grade line, transfer of point from roof to floor and floor to roof.

UNIT 4: ERRORS & PROBLEMS

Computation of areas and volumes; Earthwork calculation; Problems based on Coordinates, faults, Dip-Strike and boreholes; Sources, classification and relative importance of errors, their prevention and elimination, theory of errors, adjustment of errors.

UNIT 5: PLANS & SECTIONS

General requirements of mine plans; types of plans; Symbols used in mine plans; preparation of plans & sections; Plotting of traverse; Checking accuracy of old mine plans; Plan meter and its uses; Enlargement & reduction of plans.

REFERENCE BOOKS

1. Surface Mining: G.B. Misra
2. Surface mining equipment: Martin
3. Surface Mining: Pfleider
4. Mining: Boki
5. SME handbook: Hartman

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UNDERGROUND COAL MINING

UNIT I INTRODUCTION

Origin of Coal, Theories of Coal Formation, Classification of Coal, Coaking Coal, Coal Seam and its Classification, Coal Seam Structures and Abnormalities like Faults, Joints, Cleats, Folds etc., Coal Measuring Rocks and Their Characteristics, Distribution of Coal in India, Indian Coal Mining Industry; Choice of Coal Mining Methods.

UNIT II BOARD AND PILLAR METHOD

Important Terminology, Development Size and Shape of The Pillar, Galleries, Panel System and Without Panel System of Development, Size of Panel, Cycle Of Operation, Depillaring, Problems in Depillaring, Preparatory Arrangements, Depillaring by Stowing, Depillaring by Caving Methods, Pillar Extraction Techniques, Dangers Associated With Depillaring.

UNIT III LONGWALL MINING

Important Terminology, Types of Longwall Faces and Their Choice, Merits and Demerits of Longwall Mining, Development of Longwall Panels and Faces, Longwall Advancing Method, Longwall Retreating Method, Length of Longwall Faces, Rate of Face Advance, Double Unit Longwall Faces, Face organization and material supply.

UNIT IV THICK SEAM MINING

Problem in Mining of Thick Seams, Choice of Thick Seam Mining Methods, Inclined Slicing, Horizontal Slicing, Diagonal Slicing, Transverse Slicing, Sublevel Caving, Blasting Gallery Method, Cable-Bolting Method of Thick Seam Extraction.

UNIT V ROOM AND PILLAR MINING

Vermelles Method, Slant Method, Sublevel Method, Coal Saw Method, Mining of Contiguous Seams, Mining of Steeply Inclined Seam, Mining Under Water, Mining of Seams Prone to Spontaneous Heating, Bumps, Air blast etc.

TEXT BOOKS

1. Principle and practices of modern Coal Mining – R.D. Singh
2. Coal Mining in India – S.P. Mathur

REFERENCE BOOKS

1. Winning & working coal – R.T. Deshmukh
2. U/G winning of Coal – T.N. Singh

LIST OF EXPERIMENT

1. Study of layouts of Board and Pillar development working by without panel system.
2. Study of layouts of Board and Pillar development working by panel system.
3. Study of layout of Logwall Advancing system.
4. Study of layout of Logwall Retreating system.
5. Study of various line of extraction used for pillar extraction.
6. Study of stook extraction method under difficult roof conditions.

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UNDERGROUND MINE ENVIRONMENT – I

UNIT 1: MINE ATMOSPHERE

Pollution in Mine Atmosphere, Mine Gases, Their Origin, Occurrence, Physiological effects and Detection, Calibration of Detectors, Methane Drainage. System for Monitoring of Mine Environment

by Tube bundle apparatus and Telemonitoring systems. Analysis of Mine air by Haldane Apparatus, Gas Chromatograph.

UNIT 2: HEAT AND HUMIDITY

Heat and Humidity in Mine Atmosphere, their Sources and Effects, Cooling Power of Mine Air, Assessment of Comfort Conditions, Air Conditioning of Mines, Surface, Underground and Divided Installations, Spot Coolers.

UNIT 3: THEORY OF VENTILATION

Objects and Standards of Ventilation, Flow of Air in Ducts and Mine Roadways, Resistance of Air Ways, Laws of Ventilation, Chezy's and Atkinson's Equations, Equivalent Resistance and Equivalent Orifice of Mine.

UNIT 4: MINE VENTILATION AND VENTILATION DEVICES

Natural Ventilation Pressure and its Measurements, Thermodynamics of Natural Ventilation, Distribution and Control of Air Current, Doors, Regulators, Stoppings and their Types, Air Crossings, Air Locks.

UNIT 5: FLAME SAFETY LAMPS AND MINE ILLUMINATION

Constructional details of Flame Safety Lamp, Gas Testing by Flame Safety Lamp, Types of Portable Lamps, their Maintenance and Examination, Lamp Room Design and Organization, Lighting from Mains, Photometry and Illumination Surveys, Standards of Illumination for Underground and Open

Cast Working

TEXT BOOKS:

1. Elements of Mining Technology by D.J. Deshmukh, Vol.II
2. Mine Environment & Ventilation by G.B. Misra

REFERENCE BOOKS:

1. Mine Ventilation, UMS
2. Subsurface Mine Ventilation, M. J. McPherson

LIST OF EXPERIMENTS:

1. Detection of presence and accumulation of Firedamp in mine atmosphere.
2. Detection of presence and accumulation of CO in mine atmosphere.
3. Study of various techniques of methane drainage
4. Study of surface air conditioning plant.
5. Study of underground air conditioning plant .
6. Study of different types of ventilation devices.
7. Study of cap lamps used in underground mine.
8. Study of Flame safety lamps used in underground mine.
9. Design of a cap lamp room for a large underground coal mine.

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MINING MACHINERY – I

UNIT 1: WIRE ROPE

Wire ropes used in Mines and their installation, Application of wire ropes in Mines, Testing of wire Ropes, Factor of safety, Examination of Wire ropes, Care of wire ropes. Ropes splicing: Rope capels.

UNIT 2: HAULAGE

Different systems of rope haulage, rope haulage calculations, safety devices, tubs, haulage road and manholes, locomotive haulage and calculations based on it, track laying, mine cars.

UNIT 3: WINDING – I

Head gear arrangement, shaft fittings, safety devices, cages & skips, their suspension arrangements. Location of winding engine.

UNIT 4: WINDING – II

Electric winders, winding drums, types of construction, duty cycle, mechanical & electrical breaking, safety devices on winders, Electrical & Electronic methods of speed control, Multilevel winding; automatic winding, Torque- time & power- time diagram; calculation for winding. Pit top and pit bottom arrangements.

UNIT 5: PUMPING

Sources of mine water, types of pumps, design calculations, characteristics, operation, maintenance and selection, pump fittings, special types of pumps used in mines.

REFERENCE BOOKS:

1. Elements of Mining Tech. Vol I & Vol III by D. J. Deshmukh
2. Mining Machinery By S. C. Walker
3. Coal Mining Practice By Stathum

LIST OF EXPERIMENTS:

1. Study of Different types of Rope Capels.
2. Study of Rope Splicing.
3. Study of Clifton pulley.
4. Study of various safety devices on rope haulages
5. Study of Exhaust Conditioner on a diesel locomotive
6. Study of Cage Suspension Gear
7. Study of Detaching Safety Hook
8. Study of Lilly Controller

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MINE DEVELOPMENT

UNIT I INTRODUCTION TO MINING

History of mining, contribution of mining to civilization and national economy Indian mineral resources and world status, role of mining engineers in industry. Introduction to opencast and underground coal & metalliferous mining – selection criteria, comparison. Modes of entry into deposits for underground mining – shafts, inclines, adits, etc.

UNIT II INTRODUCTION TO DRILLING

Principles of drilling, methods, selection, applications and limitations, drill bits, flushing methods, fields of application, exploration and production drilling, drilling in underground workings, variables affecting the performance of drilling, novel methods of drilling.

UNIT III SHAFT SINKING

Selection of site and size, sinking methods, support system, ventilation, lighting and drainage arrangements during sinking, material handling and safety in sinking shafts. Introduction to piling, caisson and freezing methods - cementation method - widening and deepening of shafts. Modern techniques of shaft sink – shaft boring, design of shaft insets, pit bottom excavation and shaft raising.

UNIT IV INTRODUCTION TO EXPLOSIVES AND BLASTING

Types of explosives, fuses, detonators and other accessories, alternatives to explosives, cause of accidents and safety precautions, drilling and blasting pattern for underground excavations, merits, demerits and limitations of blasting. Storage and transport of explosives.

UNIT V DRIFTING AND TUNNELING

Drivage of drifts, organization and cycle of operations, supporting of development workings, modern methods of drifting, tunneling, road heading and tunnel boring.

REFERENCE BOOKS:

1. Hartman, H.L., Introduction to Mining Engineering, John Wiley and Sons, Second Edition, 1999.
2. Deshmukh, D.J., Elements of Mining Technology, Vol.I, Vidyaseva Prakashan, Nagpur, 1994.
3. Chugh, C.P., Drilling Technology Hand Book, Oxford & IBH Publications, 1994.
4. Chugh, C.P. Diamond Drilling, Oxford & IBH Publishers, 1999.
5. Karnam, U.M.R., Principles of Rock Drilling, 1999.
6. Bhandari S., Engineering rock blasting operations, A. A. Balkema, 1997.

LIST OF EXPERIMENT

1. To introduce the field of mining and provide basic input about mining unit operations.
2. To know the history of mining and describe the correlation between the development of mining and cultural progress.
3. To study concept of exploration & development drilling, blasting and the technology employed.
4. To learn the various modes of access and study the methods of designing the access

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MINING GEOLOGY II

UNIT 1 : INDIAN GEOLOGY

History of geology, major geomorphic division of India, general review of India, stratigraphy, description of important Indian geology formation, Archeans, Vindhians, Gondwanas and tertiaries.

UNIT 2 : STRUCTURAL GEOLOGY

Study of topographic maps, attitude of planar and linear structures, effects of topography on outcrops, Unconformities, folds, faults and joints – their nomenclature, classification and recognition, Forms of igneous intrusion – dyke, sill and batholith, effect of folds and fractures on strata and their importance in mining operations, principles of stereographic projection of linear and planar features of rocks.

UNIT 3 : PETROLEUM GEOLOGY AND COAL

Rank characteristics and important constituents of coal, classification and origin of coals, geology of the principle coal field of India, concept of organic constituents of petroleum origin, migration, accumulation, concept of traps and important petroliferous basins of India.

UNIT 4: ECONOMIC GEOLOGY

Economic geology mode of Occurrence, origin, distribution, association and industrial uses of important Metallic (Au, Al, Cu, Fe, Mn, Sn, Pb And Zn) and Non-Metallic(Diamond, mica, Radioactive Minerals, Gypsum, Dolomite, Fire-clay, Magnesite, talc, asbestos, Graphite, Kyanite, Sillimanite, corundum, Fluorite, phosphorite, Precious and Semi-precious stones)

UNIT 5: EXPLORATION AND PROSPECTING GEOLOGY

Exploration and prospecting geology definition and classification of method; elementary method of geology , geophysical ,geochemical prospecting , ringed targets intersection loci.,exploration-minral concept and viz surface and subsurface; exploration strategy and design ; stage exploration ; resource and reserves.

REFERENCE BOOKS:

1. Engineering geology-Prabin singh
2. Engineering geology- P.k. Mukherjee
3. Mineralogy-Dana
4. Courses in mining geology –Arogyaswamy
5. Geology of india and (vol 1and 2) R.Vaidyanadhan and M.Ramakrishnan

LIST OF EXPERIMENT:

1. Study of topography maps
2. Study of sterographic projection
3. Standard tensile test on MS and CI Specimen
4. Identification of rocks.
5. Identification of simple rocks forming minerals and important ores