

DIPLOMA IN MINING ENGINEERING
(Code: MN)

1. Underground Metalliferous Mine. 10 marks

Different shapes of shafts like Rectangular, square, circular, Elliptical, Different types of shafts, Vertical shaft, Incline, shaft, compound shaft, multistage Winding, Audit, Shaft station, their planning and construction, Cross-cut, Shaft station, Different types of drives like Reef drive, Foot wall drive Level Interval, Winze and Raise, Stope and Name the different methods of stoping, Different types of Bins: ore bin, brow bin, waste bin. Chute and its types.

Wooden prop, stull, logging poles, complete timber set, in-complete timber sets, joggled timber, crib set, chock mat, Arch rails used in the developmental headings, Pack walling, granite pack walling, brick pack walling, crib sets with waste filling.

The selection of site for shaft, The ordinary method of shaft sinking in normal ground. Surface plants and equipment required for sinking. Walling scaffold, Riders, Drilling pattern & Blasting in shaft sinking, Piling method of shaft sinking, Caisson method of shaft sinking, Drop shaft method, Cementation method, Freezing method of shaft sinking

Hanging wall, Footwall, Footwall drive and Reef drive. Drop rise method, Jora rise method, Alimak rise climber, Centre stack method, Compartmental method, Peg method, Long hole rise drive method. The method of winzing in general, Breast stoping, Sub-level stoping.

Method of working by shrinkage stoping, Factors influencing the rock burst. Theories of rock burst and Dome's theory, Prediction of rock burst, The measures to control rock burst.

2. Underground Coal Mining 10marks

Classify the coal seams for method of working like thickness, inclination, gassiness and depth, Basic elements in Bord and pillar method (Definition of terms Galleries, Pillar, Goaf, Drift, Heading, Face, Cross- Cut, Panel, Barrier) List out the parameters while designing the developmental openings (Height of Gallery, width, position and shape), Decide the size of Pillars. Panels, Manual method of Drivage of Galleries. The preparatory arrangements before depillaring with caving. The extraction of thin seams up to 3m by caving, Premature collapse and normal collapse. Local fall and Air blast. List out the precautions against Air blast

Basic elements of long wall face like Face, Gate, Tailgate, Goaf line, The depillaring with hydraulic sand stowing in Bord and pillar system. The general methods of long wall extraction with hydraulic sand stowing. Horizon mining, working of contiguous seams. working of steep seams, subsidence, subsidence factor, angle of draw, critical width, Critical area, sub critical area, super critical area factors affect the subsidence, the general principles of underground coal gasification

3. Surface mining. 10 marks

Suitability and limitations, stripping ratio, Quarriable limit, Design the bench height in manual and mechanized opencast mining, Design the bench width in opencast mines, the slope angle in benches, haul roads in opencast mines, Drainage system on haul roads, The safety measures to be taken on Haul roads, The problems created by water in opencast mines, the sumps in opencast mines, drills in opencast mines for blast hole drilling and secondary drilling, depth of blast holes, burden and spacing, The explosives used in opencast mines, Deck loading and water stemming,

Common excavators used in Indian opencast mines, Principle operations of a power shovel, the working ranges of dipper shovel, operation and working principle of dragline, construction and operation of dragline bucket, construction and operation of bucket wheel excavator, working of bucket wheel excavator, the principles involved in working of tractor shovel, The principle of operation and uses of bull-dozer, Ripper and scraper, Transportation system in opencast mines, Dumpers.

4. Mine Environmental Engineering 10marks

Composition of intake and return air of mine. Factors influencing the environmental condition of mine, Saturated, unsaturated air and relative humidity. Sources which contribute to the moisture content of air. Hygrometer and method of using it to find out R.H.

Cooling power and the instrument to find cooling power. Essential of mine air conditioning and explain air conditioning plants.

Physical, Chemical and Physiological effects of following gases.

(i) Oxygen (ii) Nitrogen (iii) Carbon dioxide (iv) Black damp (v) Hydrogen sulphide or stink damp (vi) Oxides of nitrogen (vii) Oxides of Sulphur (viii) Firedamp or methane.

Different gas detectors and detector tubes. Using of multigas detector and tubes. The way in with methane occurs in a mine. What methane layering and how to deal with it. The method of detecting methane or fire damp. The operation of using Methenometers. Operation and working of Ring rose automatic F.D. Detectors. Spiralarm type of F.D.detector. Meluckie detectors.

Down cast, up cast, Homotropical, Antitropical, and Assentional and Discentional ventilation. Motive column and the formula for natural ventilation. Importance of air crossings. Regulator. The importance of splitting of mine air. Road ways in series and parallel. Atkinson’s equation. Forcing vs. exhaust ventilation of mine fans. Booster fan. Explain the standards of lighting.

Duties and responsibilities of lamp room in charge. Flame safety lamp (FSL) and its safety aspects. The construction and maintenance of a flame safety lamp, The procedure of finding accumulation and percentage of methane by using a FSL. a) Barometer (b) Aneroid barometer (c) Manometer and inclined manometer and Pitot tube. The procedure of using the following velocity measuring instruments (a) Smoke and dust method. (b) Anemometer (c) Velometer. The procedure to find the quantity of air flow using formula.

Fire fighting equipments for class A, B, C, D, E fires, Interpret mine air samples Coward’s diagram, Stone dust barriers, Self contained breathing apparatus, Gas mask, Self rescuer used in mines, Drager, Pulmotor reviving apparatus, Burnside safety boring apparatus, The different mine dams.

5. Mine Machineries 10marks

The uses of wire ropes in mines, Classify wire ropes basing on place on application and construction, composition of material of wire ropes. The field tests to be conducted on wires on rope, the constructional details of different types of ropes, space factor, factor of safety, capacity factor bending factor. The different methods of capping the wire ropes,

Purpose of a head gear, the shaft fittings, the purpose of each fitting, the construction of head gear pulley, suspension gear, construction of cage and cage winding, the cage fittings.

The applicability of rigid and flexible guides, keps, safety catches, safety hooks-King type and Armoured type, the safety devices/equipment used on winding system, the principles of koepe/friction winding

The single rope friction winding-ground mounted and tower mounted, the safety equipment used in winding engine-drum and friction winding,

Direct rope haulage and Direct rope double drum rope haulage, its application, advantages and disadvantages. The working of Main and Tail rope haulage its application, advantages and disadvantages The working of Gravity rope haulage its application, advantages and disadvantages Endless rope haulage its application, advantages and disadvantages The tensioning arrangements of Endless rope haulage The method of attaching the mine tub or car to the rope by using clips and other devices. Working of belt conveyors, Idlers, Driving gear and loop take up arrangements. Tensioning arrangement of belt conveyor.

6. Rock Mechanics and Ground Control. 10marks

Importance of Rock Mechanics: Problems and application of rock mechanics. Physical properties of rocks: Porosity, Density, Water content, Permeability, Thermal and electrical properties, Anisotropy and durability. Mechanical properties of rocks: Compressive, Tensile, Shear, point load and Flexural strength.

Elasticity, Plasticity, Poisson’s ratio, Young’s modulus, Deformability, Stress strain graph, Hardness, Mohr’s scale of Hardness. Determination of elastic constant by static method: Using Compression testing machine, Brazilian test, Bending test, three point load test, Determination of elastic constants by Dynamic methods. Resonance methods, Ultrasonic pulse method

Determination of Mechanical properties: Compressive strength, Tensile strength, Shear strength, and flexural strength.

Ground vibration: Prediction and control measures.

Improvement of rock mass properties: Grouting, Methods of grouting, Rock bolts and types, Rock mass classification and slope stability. Causes of bench failures.

7. Mine Legislation and General Safety. 10marks

Necessity of Mine Legislation (Mine Act)

Meaning of the terms, Mine Act, Regulations, Rules, Bye-laws, standing orders, and situations under which act does not apply. Provisions of Mines Act in respect of Drinking water health and hygiene conservancy, Medical appliances, Hours and hourimitations of Employment - Leave with wages

Mines Rules

Mine rules related to drinking water, lavatories, and urinals with on surface and in Underground first aid, Hours and limitations of employment - leave With wages - with wages and over time,

Coal Mines Regulations / Metalliferous Mines Regulations

Important definitions, regulations related to motive of accidents duties of managers, Asst/under Managers, Overman, foreman and surveyor, mine plans and sections.

Coal Mines Regulations / Metalliferrous Mines Regulations

Means of Access and egress ladder and ladder ways under M.M.R. Transport of men and material by Haulage mine working precautions against dangers from fires dust, gas and water Mine ventilation, mine lighting and safety equipment and types of fences (Miscellaneous)

General Safety in Mines.

Classification of accidents causes for accidents, accident preventive measures, Inspection of accidents, Investigation of accidents, Accident enquiry reports. Notified miner's diseases, occupational health survey, preventive measures, permissible Standard of dustiness and threshold values (T.H.V.)

8. Basic Management Skills

10marks

Team, Group, Team building, Production and Productivity, Product Design and its Stages, Types of Production, Functions of Production, Planning and Control Department, Purchasing and its Procedure, Stores Management, Logistics, Inventory Control, Total Productive Maintenance- Concept and Techniques, Quality, Inspection-types, Total Quality management- Concept and Tools, I.S.O 9000, Quality Standards, Accident and its Prevention

9. Mine surveying

10marks

Levelling and Underground Theodolite Traversing

Different types of levelling - fly levelling, check levelling, profile levelling, cross sectioning. Errors in levelling and precautions to minimise them. Setting grade stakes and setting out grades for sewers and connected problems. Concepts of contour and terms used in contouring, characteristics of contour, uses of contours. Methods of contouring. Interpolation - arithmetical method only.

Calculation of Capacity of Reservoirs - simple problems. Computation of Area of Irregular figures using Trapezoidal & Simpson's rule. Volumes of Irregular solids- using Trapezoidal & Prismoidal Rule -

Parts, different terms, fundamental lines of a Theodolite and their relationships. Temporary adjustment of Theodolite. Measurement of horizontal angles by repetition and reiteration method. Measurement of deflection angle. Measurement of vertical angles. Errors in theodolite work.

Traverse computation-latitude, departure, closing error, balancing the traverse by Bowditch's rule and Transit rule. Area of a closed traverse.

Ceylon ghat tracer, Pentagraph, Planimeter.

Trigonometrically Levelling.

Elevations and distances of objects - base accessible and inaccessible. Single plane and double plane method

Triangulation Survey

Primary, secondary and Tertiary Triangles, well-conditioned triangle, Routine of Triangulation survey, Measurement of base line, corrections for Base line,

Underground Survey

Correlation of underground and surface surveys by different methods, survey control in drives, inclined shaft, steep sights, Gradient control

Tachometric Survey

Tachometer, Methods of Tachometry, Determination of stadia constants, Reduction of formula for Horizontal distance and Elevation when the staff is held vertical. Reduction of formula for the Tangential method, problems.

Modern Surveying Methods

Elements of Photogrammetry, application of terrestrial Photogrammetry in Mining, Basic concepts of constructions and use of modern surveying instruments like - EDM, GPS, Total station.

10. MINING GEOLOGY:

10 Marks

Definition of Geology and its branches. Weathering and its types. Definition Classification and Physical properties of Minerals. Structural Geology: Primary and Secondary structures. Parts and types of Folds, Faults & Joints. Petrology: Rock - definition, types, Classification of Rocks into Igneous, Sedimentary and Metamorphic Rocks. Textures, Structures & Classification of each group. Stratigraphy & its Principles. Maps & its types. Economic geology: definition, Ore Mineral, Gangue Mineral & tenor of Ore. Process of formation- Magmatic, Hydrothermal & Mechanical Concentration. Origin and Occurrence of Iron, Copper, Gold Chromite & Manganese. Hydrology: Zone of Saturation, Zone of Aeration. Aquifer, Aquifuge & Aquiclude.
