



**ANNEXURE - I**  
**SYLLABUS FOR THE EXAMINATION FOR FIRST CLASS MANAGER'S**  
**CERTIFICATE OF COMPETENCY**  
**WINNING & WORKING**

### WINNING AND WORKING

**Geology:** Nature and occurrence of coal seams; description of Indian coalfields; application of geology to mining; geological structures; folds, faults, fractures, fissures etc., methods of boring, boring through disturbed strata; bore hole survey; indicated and proved coal reserves; interpretation of geological maps.

**Opening of coal seams:** Legal requirement about outlets; location of outlets; vertical shaft; inclined shaft; inclines; shaft sinking and deepening; drift drivage; mechanized stone drifting; methods of sinking: mechanized sinking in ordinary and water logged grounds, in running sand etc.; freezing, cementation and other special methods; shaft supports, temporary and permanent, tubings, etc., recent developments.

**Developments and layout of mines including** surface and underground arrangements: Layout and development of shafttop, pit-bottom, haulage arrangements, etc.

**Bord and Pillar method:** Schemes of development; design of bord and pillar working; statutory provisions selection of equipment for development – mechanized loaders, continuous miners etc., preparatory arrangement for depillaring; statutory provision for depillaring; designing the system of pillar extraction with caving and stowing; mechanization in depillaring operation; types of loading machines - SDL, LHD, Continuous Miners etc.; roof management; local fall and main fall; indications of roof weighting; air blasts and precautions against the same; precautions against fire and inundation during depillaring; multi-section and contiguous working; liquidation of developed pillars.

**Longwall mining:** Method of driving single and multiple heading gate roads; longwall face layout - advancing and retreating faces; orientation of longwall face; support system for longwall gate roads; powered support; face transfer, operation of shearer and plough; roof management and hard roof management; periodic and main fall; design of high productive longwall panel; mini/short wall mining; communication and telemonitoring.

**Thick seam mining:** Board and pillar and longwall methods in multi-section; multi-slice methods; inclined slicing; horizontal slicing and cross slicing in ascending and descending orders; under-winning methods; sublevel caving; integral caving; blasting gallery and descending shield methods; hydraulic mining; special methods of thick seam mining.

**Other special methods of mining:** Wide stall method; methods of mining thin seams; underground coal gasification, coal bed methane/ coal mine methane etc.





**Opencast Mining:** Mine Planning, Opening of coal seams and preparation for excavation; box cut, types; selection of site; formation of production benches; ripping; types of rippers; concept of rippability and cycle of operation; drilling; blast hole drills; performance parameters; requirement of number of drills; blasting; blast design; factors influencing blast design; deep hold blasting; calculation of charge per hole; ground vibration; secondary blasting and problems of blasting; side casting; environment friendly non-blasting techniques such as Surface Miners and their safety aspects.

**Discontinuous / cyclic methods of excavation and transport:** shovel dumper operation; applicability of electric shovel and hydraulic excavators; cycle time and productivity calculation; estimation of equipment fleet; dragline operation; side casting; side cast diagram; calculation of reach; cycle time; productivity calculation; bucket capacity requirement; scrappers; types; methods of work; push pull operation etc., Bucket Wheel Excavator - operational methods (lateral block, half block and full block, etc.,) productivity calculation; Surface Miner - operational methods (wide/full base methods, wide/full bench, block mining, stepped cut, empty travel back, turn back and continuous mining methods); conveyors; shiftable and high angle conveyors; mode of operation etc., OITDS (operator independent truck dispatch system); in-pit crushing and strip-mining; opencast mining over developed coal seams; high-wall mining; safety aspects.

**Construction of Haul roads and ramps:** width, super elevation / camber, central bund, side bund, slope, base, sub-base, surface, Surface friction, materials required, drainage, curve, visibility, machines to be used, maintenance, monitoring, Haul road crossings, T-junction, tri-junction, four-way crossings, parameters, Parking of HEMM, parking of dump trucks, GO-line design, Shelter construction, view point construction.

Watering of mine roads for dust suppression, methods to be used, hazards due to overwatering, type of water spraying, spot or strip watering.

**Extraction of Methane:** Surface to Inseam Methane Drainage, Coal Bed Methane, Abandoned Mine Methane and Gas content of Coal; Resource and Reserve estimation; Methods of drilling and precautions required while exploration and extraction of methane; Gas production rate, project life and economy; Methods of Collection and conveying/transportation of methane; Installation of extraction wells; Hazards involved.

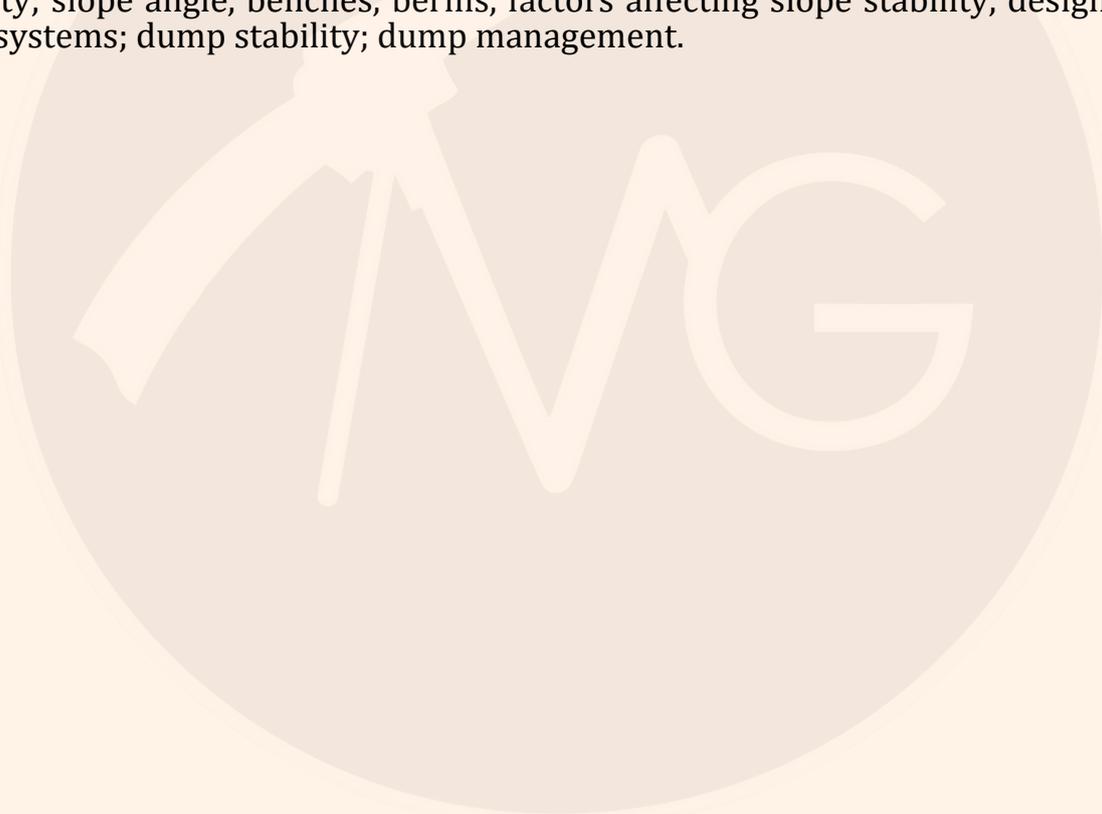
**Danger from different sources of water;** precautions to prevent inundation, siltation, bench and dump failures; designing drainage system, calculation of catchment area, sump and pump capacity, water dams, retaining walls, siltation ponds, gabion walls, water danger plans

**Blasting:** Development of safe explosives; permitted explosives; composition and testing of safe explosives Milli-second detonators; alternatives of explosives. Use and safe handling of explosives in coal and stone drivages, blasting techniques and their relative efficiency, total cost concept.

Application of numerical modeling in mine design, application of computers in mine design and operational controls.



**Application of concepts of Rock Mechanics for designing the methods of mining and strata control:** Theories of ground movement and strata control; stress, strain - compressive and tensile, shear strength uniaxial and tri-axial strength, Poisson's Ratio, Young's Modulus, convergence, elasticity, lithostatic and hydrostatic pressure; rock mass classification, strength of stooks; shaft pillar; protection of surface structures; design and stability of structures in rock; rock mass rating, design of support and reinforcement for underground excavations and open pits, support resistance, yielding and non-yielding supports, dynamic and static loading, measuring instruments, consolidated and unconsolidated fills, rock bolts, cable bolts, wire mesh, latest developments in mine supports, economics of support design, subsidence; caving of rock mass; bumps; monitoring of rock mass performance; roof management, mechanics of rock fragmentation; monitoring of rock mass performance, Types of bench and dump slope failures, Theories of ground movement and strata control, ; Dump types, internal and out of pit dumps, Dump construction, size, shape, Site selection and preparation for dumping, Methods of dumping, machines required for dump construction, consolidated and unconsolidated dumps, slope stability; slope angle, benches, berms, factors affecting slope stability, design criteria and monitoring systems; dump stability; dump management.



# MINING GYAN

