Tamil Nadu Public Service Commission

Syllabus

Mining Engineering

(Degree Standard)

Code: 604

Unit I: Geology, Mine Development, Drilling and Blasting (30 Questions)

Geology: Rock and Mineral deposits; Types of rocks and their Origin & modes of occurrence importance of minerals, mineral resources, and resources classification by UNFC (United Nations Framework Classifications), Physical and Mechanical properties of Ores and rocks, Geological structures - Geometric of a deposit, different forms of deposit, structural features of rock mass. Ore reserve estimation . Mineral inventory evaluation – Grade computation, estimation techniques, grade – Tonnage calculations. Mineral distribution in Tamil Nadu. Various prospecting and exploration methods - Fields of application & limitations. Introduction to aerial photography, remote sensing & GIS for mapping and exploration.

Role of Mining Industry in National Economy, Role of Mining Engineers in Mining Industry, Challenges faced by Mining Industry, Types of Drilling; exploratory & production drilling; operating components of a Drilling system, mechanics of rock penetration – Percussive, Rotary, Rotary – Percussive, Top hammer vs DTH drilling. Core recovery, core logging & interpretation of bore hole data, sampling techniques of core, parameters influencing drilling operations, Explosives and blasting – Classification & Properties of Explosives and its selection; Safety aspects - Storage, transport and handling and use of explosives including ANFO and accessories, initiation systems- Safety fuse, ordinary detonator, NONEL & Electronic detonator. Mechanics of rock breakage by blasting, Drilling & blast design for opencast mines (including secondary blasting), Danger zone, Misfires-causes & handling procedures as stipulated by the statutory agencies, Environmental impacts of blasting and their control, controlled blasting techniques, alternatives to blasting – Rock breakers, rippers & chemicals. Recent trends in Explosives and blasting technology – Bulk Explosives, Performance evaluation of blasting.

Unit II: Mine Environment (20 Questions)

Mine gases – Occurrence, properties, detection, physiological effects and permissible limits, Mine illumination - Standards as per DGMS circular. Types of Pollution due to mining - Noise, air, water and land pollution, Ground vibrations. Environmental monitoring and control, Pollution standards and remedial measures, Fire fighting, Inundation – Causes, prevention and control, Mine rescue and recovery, First Aid in mines.

Sustainable development goals in mining industries, Concept of environment and ecology, Landscape planning and analysis, Biosphere, Hydrosphere, Atmosphere, Nutrient cycling, Effect of industrialization in atmosphere, Air quality sampling and modelling, Impact of pollution on human health. Reclamation of mined out land, Tailings management and subsidence, Environmental impact assessment, Environmental management plans, Environmental audit, Environmental clearance for mining projects, EIA Notification – 2006 and its amendments , Environmental compliances & reporting.

Unit III: Mining Machinery (5 Questions)

Wire ropes- Types, design & applicability, Different types of Mine Pumps - characteristics and fields of application, Design of pumping systems.

Different types of conveyors and their construction, design and safety devices, High angle conveying, Design and construction of silos and bunkers, Stacking and blending, Condition monitoring of mining machinery, maintenance of HEMM – Types & organisation, vehicle tracking technique in surface mines.

Unit IV: Surface Mining (30 Questions)

Suitability of surface mining and limitations, Cut-off grades, Pit limits, Stripping ratios, Design of pit slope, bench geometry – Selection of bench height and bench width as per statutory requirements, haul roads, Box cuts, Operations & maintenance of heavy earth moving machinery - Shovels, draglines, continuous surface miners, bucket wheel excavators, dumpers, rippers, scrapers, rock breakers etc., Productivity and maintenance of Heavy Earth Moving Machinery. Waste dumps – Types, formation, maintenance & monitoring techniques. Types of slope failures, Slope stability analysis and stabilization including dumps; In-pit-crushing and conveying, Continuous surface mining. Placer mining and solution mining, conversion of opencast mines to underground mines. Truck dispatching systems, Machine availability, productive and maintenance scheduling, output, manpower and calendar planning. Quality control by blending – in working faces and surface. Conversion of waste into wealth in surface mines – Recent techniques and developments.

Unit V: Underground Mining (Coal & Metal) (5 Questions)

Coal Mining: Choice of mining methods and classification, Bord and pillar method Longwall method - advance and retreat, hydraulic mining, underground coal gasification, introduction to coal- bed methane.

Metal Mining: Classification of mining methods, Stope preparation, Stoping methods – supported and unsupported, their selection. Techno - Economic analysis of mining systems, Mining at deeper areas.

Unit VI: Rock Mechanics & Ground Control (10 Questions)

Application of rock mechanics in mining, Physico - mechanical properties of rocks and rock indices, elastic constants - laboratory and in situ testing, Rock mass classification, RQD, Post-failure behaviour of rocks, Dynamic wave velocities and elastic constants, Time dependent properties of rocks, Non-Destructive testing, Rock mechanics and ground control instrumentation, in situ stress measurement. Rock burst and bumps causes, prediction and control, etc.

Unit VII: Mine Surveying & Mineral Processing (20 Questions)

Principles of mine surveying, Underground Surveying methods, methods of levelling, contouring, curve setting, traversing, Triangulation and Correlation, Errors and adjustments, Preparation of mine plans and sections, Modern surveying techniques, Photogrammetry and remote sensing applications, EDM, Total station, GPS, GPR, GIS, Drone Survey.

Scope and objectives of mineral processing, Choice of methods, Sequence of operations, Comminution, crushing and grinding - Theories, types of crushers and their fields of application, Power consumption for crushing and grinding, Laboratory and industrial sizing, wet and dry screening, Different concentration techniques, jigging, tabling, flotation, wet and dry screenings, magnetic separation, electro-static separation, optical sorter, Sampling and control, Ore beneficiation - Generalized plant design and flow charts for beneficiation of primary Ore and other important minerals..

Unit VIII: Mine Management & Computer Applications in Mining (20 Questions)

History and development of mine management, Principles of scientific management, Functions of management, Organization structure of a mine and a mining company, Time and work study, Industrial relations, Trade union and workers participation in management, Industrial psychology, Operations

research - linear programming, transportation and assignment problems, SWOT analysis, supply chain management.

Software used in mining operations – SURPAC, Datamine, Minex, Fraglyst, etc., CAD in mining for opencast, Management information systems, ore-body modeling, Digitization and scanning, Artificial intelligence, Expert systems, Neural networks and virtual reality applications in mining – Basic definition & concept. Computer applications in mine planning.

Unit IX: Mine Legislation, Safety & Economics (40 Questions)

General provisions of Mines and Mineral Regulation and Development Act, Mineral Concession Rules, Granite Conservation and Development Rules (GCDR), Tamil Nadu Minor Mineral Concession Rules, Mines Act, Regulations and Rules, and DGMS Technical Circulars, Mines Vocational Training Rules, Land Acquisition, Explosives Act, Forest Conservation Act, Occupational Safety, Health and Working Conditions Code 2020, Indian Electricity Rules, Workmen's Compensation Act, Rescue Rules, Mine accidents, classification and occupational diseases, Accident inquiry reports and Mine disaster management, Safety audit and safety management plan. Environmental protection and conservation acts and rules, Miners diseases. Risk identification and Management, deployment of contractual operation in Mines- Statutory requirements.

National Mineral Policy, Royalty and taxation, Ore reserve estimation and geo-statistical methods, Mine valuation, Classification of reserves, Net Present Value (NPV), Depreciation, Pricing and sale of minerals, Marketing and inventory, Costing, Wages and incentives, Book keeping, Balance sheet and profit and loss accounts, Capital and revenue expenditure, DCF, profitability analysis, Economics of various mining operations , Assessment of cost of various mining operations, cost control methods.

Unit X: Mine Planning & Design (20 Questions)

Ore-body modelling, Opencast mine planning - mine cuts, surface structures, division of mining areas into blocks, Open pit optimization, Mine scheduling, Location of mine entries, Optimization of mining parameters, Planning of production capacities, production planning and scheduling, productivity indices, Techno-economic analysis, Quality control and conservation, Planning and selection of equipment, Manpower and output planning, Preparation of mining projects - feasibility and detailed project reports, Sources of funding, Government policies, Mine Closure planning for sustainability. Critical Minerals and Rare Earth Elements Occurrence in India - Types of Minerals and its usage, Ore Reserve estimation and extraction methods.

Dated: 12.01.2026