ANNEXURE I

MINING ENGINEERING

(SYLLABUS)

1. ELEMENTS OF MINING: Definitions of Terms, Mineral based industries, Mining operations, modes of entry, shaft, incline, adit, Applicable conditions, Limitations, Mining Methods used in coal and Non coal mining, Classification of the mineral deposits based on various factors, classification of coal seams based on various factors. Classification of methods of working- U/G Coal, OCM & Metal Mining, Bore(Drill) holes uses, classification and various tools used in boring(Drilling), feed mechanism, core recovery, deviation of boreholes, Core barrels. Explosives- Characteristics, classification, composition, properties, different explosives used in U/G, OCM, Metal and coal mines, selection of explosives and initiation of explosives, Fuses – types, Detonators- types. Blasting practice in Mines- terms, tools, rules and provisions related to- Induced Blasting, different types of blasting practice, different types of drill bits, reconditioning of drill bits, dangers and precautionary measures of blasting, fuse and electric blasting, dealing with misfire. Shaft sinking – Selection of site, different stages of sinking through sub soil, temporary and permanent supporting of shafts, purpose of widening and deepening. Special & modern methods of shaft sinking, pilling, drop shaft method, cementation, freezing method.

2. FUNDAMENTALS OF GEOLOGY: Definition of the term Geology, scope, uses of geology in Mining field, Branches of geology, Physical Geology, Age of the earth, origin of the earth- Nebular hypothesis of Kant and Laplace, internal structure of earth, weathering, erosion, denudation, Attrition, Abrasion, Earthquakes, Volcanoes. Mineralogy- Terms, Physical characteristics of minerals, important mineral families, industrial uses of important minerals; Occurrence and distribution in A.P and India. Petrology - Classification of Rocks and its characteristics, structures and textures. Structural Geology, folds, faults, joints, unconformities. Stratigraphy – definition, objectives, Geological time scale, major stratigraphical divisions of India, Physio-graphic divisions of India, Economic Geology- Terms, processes of mineralization and important economic minerals formed by these processes. Geological prospecting- objectives, guide lines for location of mineral deposits in fields, methods of prospecting. Coal Geology-Periods of coal formation, different stages, origin, classification of coal, coalfields in the world and India. Petroleum Geology – Petroleum – Importance, origin, Migration and Accumulation, distribution of oilfields in the world and India. Hydrogeology – Occurrence and source of ground water, vertical distribution, water table, types, Hydrological cycle, precipitation, types, rainfall measurements, Evaporation, types, Infiltration – types, factors affecting infiltration, zone of saturation and aeration, water bearing properties of rocks, porosity, permeability, Aquifer, Aquifuge and Aquiclude.

3. UNDERGROUND COAL MINING METHODS: Methods of working Bord and pillar and long wall - development, opening of districts , different methods of development systems with machines and continuous miners, depillaring. Longwall mining-Long wall advancing, longwall retreating, applicabilities, merits, demerits, limitations. Stowing practice in mines, manual and mechanized, Thick seams – Classification, Principles, methods, Merits and demerits, Special methods of working like inclined slicing, horizontal slicing, blasting gallery, horizon mining, hydraulic mining, Gasification of coal.

4. UNDERGROUND METAL MINING METHODS: Definitions: Development of mineral deposits, levels, sublevels, Winzes and Raises etc. Handling waste rock and mineral, Drilling and blasting, arrangement for loading, conventional and mechanized methods of raising, various stopping methods – classification, applicability, limitation, merits and demerits.

Sampling – classification, applicability, Assaying, Salting, Deep mining – problems, problems associated with rise in body temperature, causes, effects, treatment and preventive measures.

5. MINE ENVIRONMENTAL ENGINEERING :Ventilation, objectives/purposes of ventilation, systems of ventilation - natural ventilation and mechanical ventilation. Distribution of mine air, ventilation devices, construction location and application. Auxiliary ventilation, Booster ventilation, Homotropal, anti-tropal systems, Ventilation survey – objectives, methods, precautions and accessories, Mine gases – Composition of mine air, properties of mine air, classification basing on gassiness, physiological effects, occurrence, testing for presence of mine gases, flame safety lamp – Principle and constructional details, Gas detectors- types, determination of percentage of gases using conventional methods and using detectors.

6. MINE HAZARDS AND RESCUE: Mine fires, classification, causes preventive measures. spontaneous heating of coal, different methods of dealing with fires, Collection of air samples and interpretation of Mine air samples, Cowards diagram, calculation of CO/O2 deficiency ratio, reopening of sealed off areas, firefighting equipment and organization, Mine Explosions – Types, Fire damp explosions-causes and preventive measures, Coal dust explosions-causes and preventive measures, treating coal dust, dust barriers, water barriers. Inundation in mines, its causes, precautions, design of dams, accidents due to inundation. Miners diseases, various forms of environmental pollution due to mining, pollution control methods, various miners diseases-causes, symptoms, treatment and preventive measures. Rescue and Recovery - Operations, objectives, classification of rescue apparatus, Resuscitation apparatus, rescue organization. Gas detectors – recent techniques of gas detection, remote sensing devices, continuous recorders, monitors, Carbon monoxide and multi gas detectors.

7. MINE SURVEYING: Definitions, objectives, Principles, classification, Measurement of distances. Various instruments used in Surveying, chain survey, Fundamentals of compass survey, local attraction, magnetic declination limitation of various surveying methods, various methods of levelling, types of levels, instruments, adjustments, computations, contouring and subsidence, Theodolite types, adjustments, traversing and computations, setting out curves, types, correlation survey, tachometric survey and triangulation Survey, Dip, strike, fault problems, Fundamentals of advance survey – principles of electronic measurement, different instruments, application of remote sensing, GPS, Total station – parts and functions.

8. MINING MACHINERY: Wire ropes- usage, chemical composition, tests of wires, classification, applicability of different wire ropes, causes of deterioration and precautions, capping, recapping methods and rope splicing, Transportation in mines - classification different types of rope haulages, their applicability, merits and demerits limitations. Safety devices in different rope haulages, Locomotive haulages- types, applicability's, Conveyors-types, tensioning arrangements, use and applicability in mines, Aerial ropeways, man riding applicability's, Pumps their applicability in mines, construction details merits, demerits and limitations. Conventional face machinery, different Drills, Power loaders, Longwall face machinery-AFC, lump breakers, stage loaders, power pack, SERDS, DERDS, safety devices, power support, Flame proof apparatus and Intrinsically safe apparatus- field of applications, features, remote control principle, Signalling methods used in mines, telephones, Winding - purpose, equipment, types of headgear frames, shaft fittings, guides, Pit top and pit bottom arrangements, keps, suspension gear, types of drums, drum and skip winding, Cage winding and Friction (Keope Winding) speed control and safety contrivances.

9. SURFACE MINING AND ROCK MECHANICS: Surface mining – definition, terms, applicability, limitations, merits and demerits, benches – parameters, opening of deposits, drainage, different machinery used in surface mines, applications, merits and demerits, drilling and blasting in surface mines, methods and patterns, dangers and precautions, slope stability,

influencing factors, terms, types of failures, precautions, simple numerical problems, Environment and ecology – effects of mining on environment – different types of pollutions due to mining, Ecology – impacts of mining on ecology, EIA, EMP and reclamation. Rock mechanics – Definition, application, various forces acting on a block, stress field, stress distribution around an opening, rock properties and classification, physical and mechanical properties of rocks, theories of rock failure, behaviour and measuring devices, ground movement and subsidence, theories, factors affecting subsidence, methods of subsidence measurement, Strata control- supports, classification, types, merits and demerits.

10. MINING LEGISLATION, SAFETY AND MANGEMENT: Mines-Act, Mines Rules - provisions of Mine Act in respect of drinking water, Health, Hygiene, etc., Medical facilities. Limitations of employment, leave with wages, etc., Coal Mines/Metal Mines Regulations - Definitions duties of manager, over man, safety officer, under manager etc., Transport, Mine working ventilation etc., Mines and minerals (Development and regulation) Act 1957- provisions for Licensing- prospecting and mining, Industrial Dispute Act, Causes of disputes, work committee, strikes, lock out, Accidents in mines, safety awareness, pit safety committee, classification of accidents. Mine managementOrganization structure, Entrepreneurship, self employment scheme, market and demand survey, quality systems concepts, quality policy, quality control, quality assurance, ISO 9000, features, draw backs, recruitment, qualifications, training programmes, work-study. safety in mines and Mine accidents. Network analysis – PERT and CPM, Smart technology – Use of Internet of Things-IoT.

ANNEXURE - II

MINING ENGINEERING

(SYLLABUS)

DISTRIBUTION OF QUESTIONS UNIT WISE

Units	Topic	Questions
1	ELEMENTS OF MINING	8
2	FUNDAMENTALS OF GEOLOGY	10
3	UNDERGROUND COAL MINING METHODS	10
4	UNDERGROUND METAL MINING METHODS	10
5	MINE ENVIRONMENTAL ENGINEERING	8
6	MINE HAZARDS AND RESCUE	8
7	MINE SURVEYING	12
8	MINING MACHINERY	12
9	SURFACE MINING AND ROCK MECHANICS	12
10	MINING LEGISLATION, SAFETY AND MANGEMENT	10
	TOTAL	100

ANNEXURE - III

MINING ENGINEERING

(SYLLABUS)

MODEL QUESTIONS

1. Which of the following is used to reduce oscillation of cage in winding?
    1. Safety catches
    2. Guide ropes
    3. Keps
    4. Bell
2. Which of the following instrument is used to measure vertical angle in surveying?
    1. Chain
    2. Dumpy level
    3. Auto level
    4. Theodolite