ANNEXURE I

MINING ENGINEERING

1. ELEMENTS OF MINING:

Definitions of Mining terms, Mineral based industries, Mining operations, modes of entry-shaft, incline, adit-applicable conditions, Mining Methods used in coal and Metal 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. Explosives- Characteristics, classification, composition, properties, different explosives used in U/G, OCM, Metal and coal mines, selection of explosives and types of initiation of explosives, Detonators- types, constructional details, Blasting practice in Mines- terms, tools, sequence of shot firing, drill patterns types, misfires, blown out shots, sockets, treatment of misfires, accidents due to explosives and shot firing, preventive measures, Mine Gases- types, physical and chemical properties, physiological effects and occurrence. Shaft sinking methods – sinking through normal strata, Special methods of shaft sinking pilling, drop shaft method, cementation, freezing method. Temporary, permanent lining of shafts, Support systems in Mining their applicability and withdrawal of supports.

2. MINING GEOLOGY:

Definition of the term Geology, scope, uses of geology in Mining field, Branches of geology, Age of the earth, origin of the earth-Nebular hypothesis of kant and Laplace, Physical Geology, internal structure of earth, weathering, erosion, denudation, Attrition, Abrasion, Earthquakes, its propagation, intensity, causes and effects of earthquakes. Valcanoes and its classification,. Mineralogy-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. 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.

3. METHODS OF WORKING - COAL:

Methods of working coal by Bord and pillar method - development, opening of districts ,different methods of development systems with machines and continuous miners, depillaring. Methods of working coal by Longwall mining-Long wall advancing, longwall retreating, applicabilities, merits, demerits, limitations. Special methods of working like inclined slicing, horizontal slicing, blasting gallery, horizon mining. Stowing practice in mines.

4. METHODS OF WORKING METAL:

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, Sampling, Problems associated with deep mining, Rock mechanics and strata control measures mines.

5. OPENCAST MINING

Basic concepts about surface Mining - Stages of Surface Mining - Equipment for Land clearing and site preparation in surface mining-Drilling in OC mines - Blasting techniques in OC mines-Opencast machinery-Excavators used in Opencast mines-Transportation system in opencast mines-Inpit Crusher Technology - Inpit Crushers - Applicable conditions, merits of Spreaders - Working of Spreaders used in OC mines.Slope stability OC benches-Impact on environment and ecology due to opencast mining operations- Relationship between Environment & Ecology- EIA (Environmental Impact Assessment) - EMP (Environment Management Plan). Explain land Reclamation operations in opencast mines

6. MINE ENVIRONMENTAL ENGINEERING - 1

Ventilation, objectives/purposes of ventilation, systems of ventilation - natural ventilation and mechanical ventilation. Distribution of mine alr, ventilation devices, construction location and application. Auxiliary ventilation, Booster ventilation, Homotropal, anti-tropal systems, Gas detectors- types, uses, application, principles, determination percentage of gases using conventional methods and using detectors.

7. MINE ENVIRONMENTAL ENGINEERING - 2

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, , Ventilation survey , types, instruments, Mine Explosions – Types, Fire damp explosions-causes and preventive measures, Coal dust explosions- causes and preventive measures, treating coal dust, dust barriers, water barriers. Rescue and Recovery. Operations, objectives, classification of rescue apparatus, Resuscitation apparatus, rescue organization. Inundation in mines, its causes, precautions, design of dams. Mine lighting, purpose, Terms, Places to be illuminated in the mines. Flame safety lamp- Different types, construction details. Miners diseases, causes and preventive measures. Gas Detectors, Continuous monitoring of ventilation systems and Mine Lighting.

8. MINE SURVEYING:

Definitions, Principles, classifications, Measurement of distances. Various instruments used in Surveying, chain survey, Fundamentals of compass survey, limitation of various surveying methods, various methods of leveling, types of levels, instruments, adjustments, computations, theodolite types, adjustments, traversing and computations, setting out curves, types, correlation survey, tachometric survey and triangulation Survey. Electronic Surveying, GPS and GIS, Survey with Total station.

9. MINING MACHINERY - 1

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.

10. MINING MACHINERY - 2

Coal face machinery, different Drills, Power loaders, Longwall face machinery-AFC , lump breakers, stage loaders, Hydraulic power pack, SERDS,DERDS; Safety devices, power support, Mine cables- types, constructional details, Flame proof apparatus and Intrinsically safe apparatus- field of applications, features, remote control principle, Signaling 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 (Koepe Winding) speed control and safety contrivances.

11. MINE MANAGEMENT, LEGISLATION AND SAFETY:

Different provisions of Mine Act and Mine Rules in respect of drinking water, Health, sanitation, etc., Medical facilities. Limitations of employment, leave with wages, etc.

Coal Mines/ Metaliferrous Mines Regulations – Definitions, duties of manager, over man, safety officer, under manager etc., Provisions related to Transport, Mine working ventilation etc., Precautions against dangers from fire, dust gas, water etc., Mine lighting and safety.

Industrial Dispute Act, Causes disputes work committee, strikes, lock out. Mine Management-Organization structure, safety in mines and Mine accidents.

Indian Electricity rules applicable to mines.

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.

Safety in mines, Accidents in mines, Mine Vocational Training Rules.

12. MINERAL PROCESSING AND QUALITY CONTROL

Ore Dressing /Mineral Processing, Coal Cleaning, Comminution-Objective of Comminution, Classify the Comminution Process, Principles of Crushing, Type of Crushers, Working principles and Operation of different crushers Grinding, Compare Crushing and Grinding, Classify the Grinding Mills. Industrial Sizing-Define Screening and Classifiers, Define Mesh Number and Mesh Size, types of Industrial Screens. Concentration- Working principle of Magnetic Separator, DMS, Jigging and High Tension Separators. List the Gravity Concentration Process, Sink and Float Technique, Working Principle of Tabling, Principle of Jigging, Define Froth flotation. Clean Coal Technology-Understand the Clean Coal Technology, Energy and Environment Benefits of CCT, General Importance of Coal cleaning, Development of Clean Coal Technology, Technology for CCT, the Negative impact

on Environment due to Coal usage, How to Remove of Impurities, the Process, Improve the Calorific value of Coal

ANNEXURE II

Number of questions to be set unit wise (Total 100)

MINING ENGINEERING

Unit No	Topic	Marks
1	ELEMENTS OF MINING	08
2	MINING GEOLOGY	08
3	METHODS OF WORKING – COAL	8
4	METHODS OF WORKING METAL	8
5	OPENCAST MIINING	07
6	MINE ENVIRONMENTAL ENGINEERING – 1	07
7	MINE ENVIRONMENTAL ENGINEERING - 2	08
8	MINE SURVEYING	13
9	MINING MACHINERY – 1	07
10	MINING MACHINERY – 2	08
11	MINE MANAGEMENT, LEGISLATION AND SAFETY	12
12	MINERAL PROCESSING AND QUALITY CONTROL	6
	Total	100

ANNEXURE III
MODEL QUESTIONS FOR MINING ENGINEERING

1. In the following gases which one is Poisonous?
   1) CH_4 2) CO_2 3) O_2 4) CO
2. For steeply inclined road ways which type of rope haulage is used.
   1) Direct rope haulage
   2) Endless rope haulage
   3) Gravity rope haulage
   4) Main and Tail rope haulage
3) Fissure vein deposits are
   1) Magmatic concentration deposits
   2) Cavity filling deposits
   3) Sublimation deposits
   4) Residual concentration deposits