ANNEXURE – II
SYLLABUS FOR THE EXAMINATION FOR SECOND CLASS MANAGER'S CERTIFICATE OF COMPETENCY
MINING MACHINERY

MINING MACHINERY

Strength of materials; Applied mechanics; Fluid mechanics.

Theory of Machines: Machine design, different types of gears and drives, bearing, collars and joints, brakes and friction clutches, governors.

Heat engines: General outline of working principles of steam generators and auxiliary equipment, condensing plant, reciprocating steam engines, turbines, internal combustion engines, conduct of gas, oil and steam engine trial; mechanical efficiency of engines, measurement of indicated and brake horsepower.

Machine tools and workshop processes

Wire ropes: Construction details, applications, mechanical properties, breaking load, factor of safety bending factor, capacity factor, snap length, critical depth inspection; examination and discarding criteria; rope capping and splicing.

Mine winders: Types and applications components; shaft fitting; drums and sheaves; ropes and guides; drives and control systems; automatic contrivances; brakes; cage; skip; counter weight and suspension arrangement; duty cycle diagram; winder capacity and motor power calculations; equivalent mass of winder installation; safety devices;
Installation; examination and testing of winding equipment, nondestructive testing.

Underground machinery: Coal drills; jumbo drills; roof bolters; quad bolters; UDM; shearers; ploughs; AFC; road headers; ding headers; continuous miners; shuttle cars; SDLs; LHDs.

Material handling equipment in mines: Types, construction and operation; safety devices; maintenance and calculations for rope haulages; locomotives (tractive effort, draw bar pull, ideal gradient), conveyors, systems (belt conveyor, chain conveyor, cable belt conveyor, high angle conveyor, shiftable belt conveyor, pipe conveyor); scraper winches, aerial rope-ways, communication equipment, man riding systems; in-pit crushers, feeder breaker etc., EOT cranes (electric overhead travel) and other cranes, hydraulic lifter, tyre handler, mine cars, track design and layout; super elevation; track fitting and safety appliances; self acting inclines; coal handling plants; rail wagon loading; plants; use of diesel equipments in underground coal mines, free steered vehicles.

Pumps: Types, Characteristics, motor power, capacity and calculations, laying of water mains, dealing with acid water; slurry, drainage; lodgements, storage, designs and layout of dams, sumps, pumping problems.

Opencast machinery(electric and hydraulic): Constructions, function and operation of blast hole drills, rippers, scrapers, shovels; draglines, dumpers, road graders, dozers, wheel loaders; Bucket Wheel Excavators; spreaders; surface continuous miners, rock breakers and their maintenance aspects, water-trucks, In-pit crushing conveying (IPCC).

Generation, transmission and utilization of Power, Steam and compressed air: Air compressor and auxiliary equipment; air turbines and air engines; efficiency of power, steam systems; safety aspects.

Maintenance Systems: Monitoring and reporting, tribology – corrosion, planned maintenance, Preventive, periodical and total maintenance systems in mines. Condition based monitoring and related maintenance system.

Mine electrical engineering: Generation, Transmission and distribution of electrical power in mines; radial and ringmain distribution; power economics; industrial tariffs; power factor improvement; sub-station arrangements; short transmission lines; cables; switch gears and protective devices; protective relays; circuit breakers; gate-end box; drill panel; field switch; transwitch; symmetrical fault and circuit breaker rating; mine signaling; electrical drives and semiconductor controllers; selection of motors and starters; semiconductor devices; principles of operation of thyristor controlled variable speed electrical drives; electrical breaking; earthing; flameproof enclosures and intrinsic safety; use of high voltage operational equipment in mines.