

**ANNEXURE – I
SYLLABUS FOR THE EXAMINATION FOR FIRST CLASS MANAGER'S
CERTIFICATE OF COMPETENCY
MINE VENTILATION**

MINE VENTILATION

Composition of mine atmosphere: Mine gases - generation, properties and effects; sampling and analysis of mine air; methane content; methane drainage; flame safety lamp; Methanometers and multi-gas detectors; gas chromatograph; methane layering; monitoring of different gases; telemonitoring; coal bed methane/coal mine methane.

Heat and humidity: Sources of heat in mines; geothermal gradient; heat flow in deep mines; effects of heat and humidity; psychometrics; computation of thermodynamic properties of mine air; basic modes of heat transfer in mines; methods of calculation of heat flow and temperature rise in mine airways; heat and moisture transfer in bord and pillar and longwall workings; Computation of heat load due to various machines e.g. belt conveyor, power pack, stage loader, lump breaker, armoured flexible conveyor, shearer etc. in longwall gate roads and face and road header, continuous miner and underground sub-stations etc. in the mine; air cooling and conditioning.

Air flow in mines: Laws of air flow; resistance of airways; resistance and splitting problems; equivalent orifice; flow control devices; permissible air velocities. Natural ventilation: Seasonal variations; calculation of natural ventilation pressure; thermodynamic principles and other short-cut methods.

Mechanical ventilation: Theory of different fans; characteristics and suitability of fan; selection, testing and output control; fans in series and parallel; reversal of air flow; fan drift, diffuser and evasee; booster and auxiliary fans; ventilation of heading and sinking shafts; standards of ventilation; ventilation calculation.

Ventilation planning: Ventilation layout; determination of size of shafts and airways; estimation of air quantity requirements; ventilation network analysis; Hardy Cross methods of iterative analysis and application of linear theory; thermodynamic network analysis and computer application; application of numerical modeling; estimation of pressure requirement; ventilation survey; recent development in mine ventilation, ventilation plans.

Airborne dust: Generation, dispersion, measurement and control; suppression and treatment of coal dust; properties of stone dust; sampling and analysis of coal dust.

Mine fires: Cause of mine fires, spontaneous combustion, mechanism and susceptibility indices detection and prevention of spontaneous heating and mine fires; dealing with mine fires; sealing off fire-areas; build-up of extinctive atmosphere; pressure balancing; fire fighting organization; gas ratios and their limitations; modified gas ratios; reopening of sealed off fire areas; fires in quarries over developed pillars; coal stack and waste dump fires.



Mine explosions: Fire damp and coal dust explosions; cause and prevention; stone dust barrier; water barrier and other methods.

Explosion in quarries over developed pillars; Water gas explosion.

Inundation: Causes and prevention; precautions and techniques of approaching old water logged working; safety boring apparatus; pattern of hole; design and construction of water dams; water lodgements; monsoon preparations, water danger plan.

Rescue and Recovery: Rescue and recovery in mines - rescue apparatus; organization of rescue work; investigation, emergency preparedness and response system; emergency organization; recovery of mine after explosion, fires and inundation.

Illumination: Cap lamps, layout and organization of lamp rooms; standards of illumination; photometry and illumination survey.

Risk Management: Risk assessment and analysis with reference to mine environment, management of environmental risks.

MINING GYAN

