Syllabus for Mine Ventilation, Explosions, Fires and Inundation

Test 1:

- Composition of mine atmosphere: Mine gases; generation, properties and effects; sampling and analysis of mine air; flame safety lamp; monitoring of different gases; inflammability of fire damp; fire damp explosions.
- 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 stopes; Computation of heat load due to various machines in development workings and stopes e.g. drills, road headers/tunnel borers, LHDs, low profile dumpers, locomotives, lump breakers, crushers, belt conveyors, underground sub-stations, etc.; air cooling and conditioning.

Test 2

- 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 headings and sinking shafts; standards of ventilation; ventilation calculations.

Test 3

- Ventilation planning: Ventilation layout; determination of size of shafts and airways; estimation of air quantity requirements; ventilation network analysis; Hardy Cross method of iterative analysis and application of linear theory; thermodynamic network analysis and computer application; application of numerical modelling; estimation of pressure requirement; ventilation survey; ventilation plans.
- Airborne dust: Generation, dispersion, measurement and control; suppression and treatment of mine dust; sampling and analysis of mine dust.
- Mine fires: Types; causes; detection; prevention and control of mine fires; spontaneous heating; dealing with mine fires; sealing off fire-areas; build-up of extinctive atmosphere; fire fighting organisation; reopening of sealed off fire areas.

Test 4

- Firedamp and sulphide dust explosions: Causes and prevention; stone dust barrier; water barrier and other methods.
• Inundation: Causes and prevention; precautions and techniques of approaching old waterlogged workings; safety boring apparatus; pattern of hole; design and construction of water dams; water lodgements; water danger plan.
• Recovery of mines after explosions, fires and inundation and investigations after the same; rescue and recovery in mines; rescue apparatus; organisation of rescue work; emergency preparedness and response system.

Test 5

• Flame safety lamps and their design; use and maintenance; testing of safety lamps; lamp houses and organizations.
• Illumination: Cap lamps; layout and organisation of lamp rooms; standards of illumination; photometry and illumination survey.
• Recent developments in mine ventilation; use of numerical modelling in ventilation planning.
• Risk Assessment and analysis with reference to mine environment, management of environmental risks.