

B.E. (MIN) Part-II 4th Semester Examination, 2010

**Underground Mine Environment
(MN-403)**

Time : 3 hours

Full Marks : 70

Use separate answerscript for each half.
Write all parts of a question at same place.

FIRST HALF

[Answer O.No. 1 and any TWO from the rest.]

1. Write short notes on the followings:
 - a) Illumination at longwall face
 - b) Heat stroke
 - c) Ignition point & lag of ignition
 - d) Physiological effect on exposure to CO. (3+3+4+3)

2. a) In a sample of mine air it was found that the explosive gases consist of CO, H₂, C₂H₂, C₃H₆ and CH₄. The explosive limits and percentage in the samples are as follows:

	Lower limit (%)	Upper Limit (%)	Sample (%)
CO	12.5	74	10
H ₂	4.1	74	10
C ₂ H ₂	2.5	65	10
C ₂ H ₆	3.2	12.5	20
CH₄	4.8	14.8	50

Find the lower and upper explosive limits of the gas mixtures,
b) What is the significant of high wet-bulb temperature? (7+4)

3. a) A fan ventilating a heading through a duct of 600mm diameter circulates 4 m/s of air at the face. Calculate the heat added to the air by the fan, if the input power of the fan is equal to 2.9 kW.
b) The analysis of a sample of mine air gives 19.5% O₂, 77.43% N₂, 0.6% CO₂ and 2.47% of **CH₄**. Determine the percentage and composition of blackdamp in the same. (5+6)

4. a) Draw a schematic diagram of a closed-circuit breathing apparatus and describe,
b) Describe the impact of noise on human body. How noise level can be reduced in mines? (5+3+3)

5. a) Describe causes of firedamp explosion. How it can be prevent in underground coal mines?
b) Compare between coal dust and fire damp explosion. (4+3+4)

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SECOND HALF

fAnswer O.No.6 and any TWO from the rest.)

6. Answer as directed - [1x13]
- i) Name the process by which heat is produced by men
 - ii) Write Dubois equation
 - iii) What is the rate of auto compression of air in a shaft?
 - iv) How much heat is generated (average) by a diesel loco?
 - v) The heat generated by solid blasting in an hour is of the order of_•
 - vi) What is the ignition temperature of bituminous and anthracite coal?
 - vii) Why silica dust is very dangerous?
 - viii) What do you mean by naturally wet?
 - ix) What action would you take if the dust concentration is in excess of 1 V4 times of its PL?
 - x) In which method of sampling, the samples shall be collected from the areas treated separately with incombustible dust and water?
 - xi) All surface structures and supports within a horizontal distance of_____• from any mine entrance shall be of fire-proof material
 - xii) No workings are permitted within a horizontal distance of_____from either bank of river, boundary of lake, tank or other surface reservoir.
 - xiii) What are the ingredients essential for a fire to take place in a mine?
7. How can you prevent liberation, accumulation and propagation of dust in mines? State the Scheme on dust monitoring and control to be developed by a colliery manager. [7+4]
8. What are the sources of heat in mines? State the factors responsible for spontaneous heating. What are the measures to be taken to keep the air-borne dust level within the stipulated limit? [5+3+3]
9. i) State the properties of -
- a) DSI,
 - b) Incombustible dust characteristics as per CMR.
- ii) State the statutory duties of
- a) Sampling Incharge,
 - b) Dust Incharge. [2+2+4+3]
10. State the precautions to be taken for the following cases -
- a) After a fire has broken out in mines,
 - b) UG precautions against fire,
 - c) Abnormal seepage is noticed in a mine. [4+3+4]