B.E.(with Credits)-Regular-Semester 2012-Mining Engineering Sem. V

MN502 - Mine Climate Engineering

P. Pages : 2 **GUG/W/16/3805**

Time : Three Hours * 3 9 9 0 * Max. Marks : 80

Notes : 1. Due credit will be given to neatness and adequate dimensions.
2. Assume suitable data wherever necessary.
3. Diagrams and Chemical equation should be given wherever necessary.
4. Illustrate your answers wherever necessary with the help of neat sketches.
5. Marks are indicated in the right margin.

1. Explain : **16**

a) Physiological effect of whitedamp.

b) Methane Layering

c) Gas Chromatography

d) Sampling of Mine Air.

OR

2. a) Calculate the percentage of blackdamp and its composition in a mine air sample which on analysis gave the following results. **8**

$O_2 - 19.75\%, \quad N_2 - 77.95\%, \quad CO_2 - 0.4\%, \quad CH_4 - 1.9\%$

b) Explain : **8**

i) Environmental monitoring system in mines.

ii) Radon gas and its daughter products.

3. a) Explain the following terms **10**

i) Wet Bulb temperature.

ii) Relative humidity

iii) Cooling power of mine air.

iv) Motive column.

b) A fan passes $9000\,m^3/min$ at 1 kpa when running at full speed and $6000\,m^3/min$ at 400 Pa when running at a slow speed. Calculate the N.V.P. acting across the mine. **6**

OR

4. a) Calculate wet Kata cooling power if the wet bulb temperature is 27ºC and air velocity is 2 m/s. **6**

b) Two connected shafts are 1200 m deep. The downcast shaft average temp. is 12.8ºC, the upcast shaft air temp. is 26.7ºC. Calculate the NVP in N/m^2 as well as in meters of motive column of air. Barometer reading at the shaft collar is 94.817 Kpa. **10**

5. a) State Laws of Mine Air friction. Also derive Atkinson's equation from the same. **8**

b) An unlined roadway is 3.6 m wide, 2.4 m high and 300 m long. Calculate : **8**

i) resistance of the roadway.

ii) Equivalent orifice of the roadway.

iii) Pressure required to maintain a flow of $10\,m^3/sec$ through it.

OR

6. a) Three splits in parallel of similar cross – section and same type of roadway surface are respectively 300m, 600m and 900m long. Calculate the quantity of air which would flow in each if the total quantity is $200\,m^3/min$. **8**

b) Write short notes on : **8**

i) Standards of Ventilation.

ii) Vane Anemometer.

7. a) Discuss in detail the factors to be considered in the selection of main mine fan. **8**

b) The evasee Chimney of a fan has an area of $4\,m^2$ at the base and $12\,m^2$ at the outlet. Calculate the saving of pressure and airpower due to Chimney when the fan delivers $4000\,m^3/min$. Assume air density to be $1.2\,kg/m^3$ and efficiency of evasee to be 50%. **8**

OR

8. a) Explain the following terms **6**

i) Operating point

ii) Manometric efficiency

iii) Volumetric efficiency

b) Explain performance of backward bladed centrifugal fan and Axial flow fan with the help of characteristic curves. **10**

9. a) State the desirable features of good ventilation system. **8**

b) Explain bi-directional ventilation system with neat sketch. Also state its merits and demerits. **8**

OR

10. a) Explain the procedure of estimation of total air – quantity requirement of the mine. **8**

b) Discuss the factors affecting economic design of mine airways. **8**

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