CBCS Scheme

Fifth Semester B.E. Degree Examination, Dec.2017/Jan.2018
Mine Environment and Ventilation Engineering

Time: 3 hrs.   Max. Marks: 80

Note: Answer any FIVE full questions, choosing one full question from each module.

Module-1

1   a. During development of a panel in an underground coal mine, rotten egg smell was observed over a period of time by the miner. The miners were unconscious after some time of exposure in that environment. Please discusses the reason behind the rotten egg smell and physiological effect on the miner. **(08 Marks)**

    b. Three air streams meet to form a common main return air stream of $1550 m^3/min$. The initial air stream contains CH_4 as follows :
    i) $300 m^3/min$ – No methane   ii) $600 m^3/min$ – 0.7%   iii) $650 m^3/min$ – 1.1%
    in additional there is a blower in the main return air way giving $2.5 m^3$ of pure methane/min.

        i)   Final concentration of CH_4 in return airway

        ii) Vol required (q) to reduce the final CH_4 concentration by 30% assuming other quantities are not changed. **(08 Marks)**

OR

2   a. In an underground coal mine, approximately $30 m^3$ of methane of slow exudation was found over a period of time in the main coal seam (thickness 2m) and a thin seam of 0.4m was found above coal seam at a distance of 30m from main coal seam. Discuss the method of methane drainage to be adopted to extract methane economically. **(08 Marks)**

    b. In an underground coal mine, the ventilation officer assistant was carrying a flame safety lamp in a road way suddenly the flame spired in the lamp. The official doubted the presence of gas caused the spiring of flame. Explain the reason behind the spring of flame if it is due to a presence of gas and also explain the procedure to be adopted for testing the % of gas. **(08 Marks)**

Module-2

3   a. Determine the density of air, if 'B' is the barometric pressure and 'e' is the water vapour pressure and 'T' is the temperature. **(08 Marks)**

    b. Explain the sources of Heat in mine air. **(08 Marks)**

OR

4   a. Calculate amount of heat added to the mine air by the following :

        i)   200kW main underground pump pumping water at $5 m^3/min$ through a head of 150m

        ii) A diesel LHD operating on level ground and consuming 7.5kg of fuel per hour, heat content of the fuel is 40.1 mJ/kg.

        iii) A A – kW battery locomotive operating on a level road way. **(08 Marks)**

    b. Explain the effect of Heat and Humidity on the miner. **(08 Marks)**

Module-3

5   a. Prove that, there is a pressure drop depending upon the amount of frictional work along a path of flow of a gas. **(08 Marks)**

    b. A pressure of 490 Pa is absorbed by $40 m^3/s$ air passing through a 4m diameter shaft. Calculate the flow of air in the shaft if its diameter is enlarged to 6m assuming that the pressure drop across the shafts remains unchanged. Also calculate the pressure drop in the enlarged shaft if the flow is maintained at $40 m^3/s$. **(08 Marks)**

OR

6 a. In the following ventilation circuit, values of resistance for individual airways have been determined in N-s^2/m^8. **(08 Marks)**
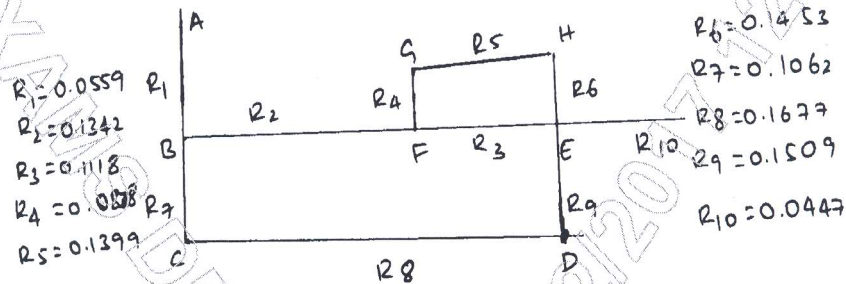

Fig. Q6(a)

If the fan is exhausting 47.19m^3/s, determine the equivalent resistance of the entire system and the mine static head.

b. Two airways of like cross – section in parallel are respectively 1000m and 5000m long. Total airflow is 90m^3/s. Calculate the airflow in each split. **(08 Marks)**

Module-4

7 a. Explain the method of determining N.V.P with respect to thermo-dynamic consideration by considering frictional work and addition of gases. **(08 Marks)**

b. A centrifugal fan under test, running at constant speed, gives the following result

Vol (m^3)	1000	2000	3000	4000	5000	6000
Pressure mm (w.g)	104	116	114	104	88	55

Find the change in volume of air delivered by the fan and the w-g produced by it when mine resistance changes from 0.02 – 0.03 Weisbach. **(08 Marks)**

OR

8 a. Determine the N.V.P from
   i) From pressure and Quantity measurements with running and fan stopped
   ii) From pit – bottom pressure with fan running and fan stopped
   iii) From pressure across a stopping in fan drift
   iv) From fan pressures and Quantities at two different speeds. **(08 Marks)**

b. Explain the method of selection of fan with an example. **(08 Marks)**

Module-5

9 a. The surface barometer reading at a mine is 98.35kPa at a temperature of 304K. Another barometer reading taken in the mine at the same time at a depth of 723m from the surface gives 106.26 KPa at a temperature of 309K. Calculate the ventilation pressure loss between the surface and underground location. **(08 Marks)**

b. Explain the air distribution to be adopted in case Bord and pillar method of mining. **(08 Marks)**

OR

10 a. What is the current velocity in an airway when the pitot tube reading is 4mm, barometer 760mm and temperature 17°C. **(06 Marks)**

b. Explain the air distribution to be adopted in case of long wall method of wing. **(10 Marks)**

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