

# CBCS SCHEME

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15MN51

## Fifth Semester B.E. Degree Examination, Dec.2018/Jan.2019 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. Calculate the percentage of various damp present in a mine which gave the following air analysis results :  
 $O_2 = 19.11\%$ ,  $N_2 = 79.04\%$ ,  $CO_2 = 0.25\%$ ,  $CO = 0.02\%$ ,  $CH_4 = 1.58\%$ . (06 Marks)
- b. The rate of emission of methane at a long wall face is  $0.095\text{m}^3/\text{s}$ . Calculate the rate of ventilation required to keep down the level of  $CH_4$  in return gate at 0.7% if the intake air has a methane cone of 0.2%. (04 Marks)
- c. A miner was examining the samples of after damp, where a strong suffocating odour occurred to him. What is the reason behind it. Explain the physiological effect and detection method for the same. (06 Marks)

OR

- 2 a. A red colour fume was observed during a sample collection inside a Mine (u/g). Reason behind the fumes. Discuss any physiological effect for the same and permissible limits. (06 Marks)
- b. How long could a man remain conscious in a heading  $2 \times 2.5\text{m}$  in c/s when it has been sealed by a fall 10m behind the face? The air in the heading contains 20.1%  $O_2$  and 0.1%  $CO_2$ . Assume unconsciousness to follow 7%  $O_2$  or 10%  $CO_2$  in the air. The average  $O_2$  breathing rate of the man may be assumed as  $0.3 \times 10^{-3} \text{m}^3/\text{min}$  with a respiratory quotient ( $CO_2$  produced by  $O_2$  inhaled) of 0.82. Determine whether  $O_2$  deficiency or the effect of  $CO_2$  will have dominating influence. (10 Marks)

### Module-2

- 3 a. A fan ventilating a heading through a duct of 600mm dia circulates  $5\text{m}^3/\text{s}$  of air at the face. Calculate heat added to air by the fan, if input power of the fan is 4kW. (06 Marks)
- b. Determine the density of air, if the temperature and pressure is varying with range met in mines. (10 Marks)

OR

- 4 a. Explain the effect of heat and humidity on miner. (10 Marks)
- b. Define : i) Absolute pressure ii) Gauge pressure iii) Velocity pressure  
iv) static pressure v) Barometric pressure vi) Total pressure. (06 Marks)

### Module-3

- 5 a. Prove that there is always a drop of pressure depending on the amount of friction work along path of flow of a viscous fluid. (10 Marks)
- b. Consider, a fluid flows through a horizontal circular pipe of uniform c/s. Explain the effect flow based on Reynolds's number, over the range of c/s. (06 Marks)

**OR**

- 6 a. Determine the resistance of airways, when they are connected in series and parallel. (06 Marks)
- b. Explain the effect of co-efficient of friction in pressure loss due to friction and the shock factor in pressure loss due to shock resistance. Determine the total pressure loss over for the airway with obstruction and friction (10 Marks)

**Module-4**

- 7 a. Determine the NVP with respect to thermodynamics considering auto compression, motive column frictional work, moisture content and gases. (10 Marks)
- b. Air temperature in DC and UC shafts 465m deep is 303°C and 310°C respectively. Calculate the height of motive column. Find out also the density of DC air and the amount of natural ventilation pressure. (06 Marks)

**OR**

- 8 a. Calculate the theoretical head from Euler's equation of the centrifugal fan. (10 Marks)
- b. Explain the procedure determining the selection of fan graphically considering diameter of impeller, BHP, pressure and quantity. (06 Marks)

**Module-5**

- 9 a. Explain the ventilation network method used in Bord and Pillar method with figure. (10 Marks)
- b. Explain steps in ventilation planning. (06 Marks)

**OR**

- 10 a. Explain the ventilation network method used in long wall method with figure. (10 Marks)
- b. Explain the use and operation of Viscometer. (06 Marks)

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