CBCS SCHEME

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17MN51

Fifth Semester B.E. Degree Examination, Jan./Feb.2021
Mine Environment and Ventilation Engineering

Time: 3 hrs. Max. Marks: 100

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

Module-1

1 a. With a table list the composition of atmospheric air by percentage of volume and mass. **(10 Marks)**

b. During the development of a panel in a underground : a rotten egg smell was observed over a period of time. The miners were unconscious after some time exposure in that environment. Discuss the reason behind the rotten egg smell and the physiological effects. **(10 Marks)**

OR

2 a. A sample of mine air has the following volumetric composition, $O_2 = 19.81\%$, $CO_2 = 0.92\%$, $CH_4 = 1.02\%$ and $N_2 = 78.25\%$. Calculate the composition by mass, what would be its composition (both by volume and by mass) if the air were saturated with water vapour at the sampling temperature at 303 K and atmospheric pressure at 101.33 kPa. **(10 Marks)**

b. The analysis of a sample of air from old working is reported as follows : $O_2 = 16.52\%$, $CO_2 = 3.1\%$, $CH_4 = 2.45\%$ and $N_2 = 77.93\%$. Find the percentage of air and black damp in the sample as well as the composition of black damp. (Consider atmosphere contains $O_2 = 20.95\%$, $CO_2 = 0.03\%$, $N_2 = 79.02\%$) **(10 Marks)**

Module-2

3 a. Explain the objective of an underground mine ventilation. **(10 Marks)**

b. Explain the any two methods of improving the cooling power of mine air. **(10 Marks)**

OR

4 a. What will be the effect of heat and humidity on a miner when body temperature shoots up? **(10 Marks)**

b. Determine the density of air considering barometric pressure, water vapour pressure and temperature. **(10 Marks)**

Module-3

5 a. Explain the fundamentals of air flow in a mine. **(10 Marks)**

b. Determine the pressure loss due to friction (General Energy balance equation). **(10 Marks)**

OR

6 a. Explain the 'Reynold's number'. **(10 Marks)**

b. A pressure of 490 Pa is absorbed by 40 m^3/s air passing through a 4 m diameter shaft. Calculate the flow of air in the shaft in its diameter is enlarged to 6 m 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. **(10 Marks)**

Module-4

7 a. Calculate the natural ventilating pressure in a mine given the following data:
Depth of mine = 300 m, Pit bottom barometer reading = 101.27 kPa, Pit-top barometer reading = 98.10 kPa, Average temperature in DC shaft = 304 K and Average temperature in uC shaft = 307 K. **(10 Marks)**

b. If you are planning a deepen underground mine, calculate the effect of NVP considering air densities. **(10 Marks)**

OR

8 a. What are Evasee and Diffusers? Explain them. **(10 Marks)**

b. Interpret the selection of fan based on mine parameters. **(10 Marks)**

Module-5

9 a. Explain the importance of ventilation survey. **(10 Marks)**

b. If two shafts located nearby in an underground Coalmine and the method of extraction adopted is Bord and Pillar. Choose suitable and feasible method of ventilation, with the ventilation plan. **(10 Marks)**

OR

10 a. 15 kg of explosives are fired in a 2×2.5 m drive which is 100 m long. Calculate the quantity of air to be circulated by auxiliary fan to bring down the concentration of nitrous fumes in the drive to the tolerable limit of 5P.P.M within a period of 5 minutes 'A' kg of explosives produce 2000 cm^3 of nitrous fumes. **(10 Marks)**

b. If two shafts located far from each other with high depth in a underground metal mine choose the suitable and feasible method of ventilation planning. **(10 Marks)**

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