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**Course:** 7<sup>th</sup> Sem B.Tech. (MNE, MME, EE, ECE, CSE, M&C, MLMTE, & PE) & JRF  
**Session:** 2024-2025

**Semester:** Mon

**Time:** 2 hrs

**Subject:** Mine Environmental Engineering (MND – 406)

**Max. Mark:**

Q.No.	Instructions: Answer ALL questions.				<b>Marks</b>																				
	Question																								
1	<p>a) Air is flowing with a flow rate of <math>24 \text{ m}^3/\text{s}</math> in a roadway of 4 m width <math>\times</math> 3 m height <math>\times</math> 100 m length in an underground coal mine. Is there any danger of methane layering if the percentage of methane in the mine atmosphere is 3.5%?</p> <p>b) A long heading 5 m wide and 4 m high is ventilated by a forcing tube circulating <math>4 \text{ m}^3/\text{s}</math> of air at the face. Calculate the distance from the face at which all the <math>+10 \mu\text{m}</math> dust particles would have settled down from the airstream. The dust particles have a density of <math>2650 \text{ kg/m}^3</math>. Assume your own data, if required.</p>				3																				
2	How can the concentration of air-borne dust be determined? What impact the types of dust found in coal mine have on human system? What preventive actions would you recommend to avoid the mine dust becoming airborne? What do you consider to be the safe limit in Indian underground coal mines?				2+2+2+2																				
3	How is the functioning of stone dust barriers different from that of stone dusting in underground mine workings? What steps would you take to make them effective?				4+4																				
4	<p>The following gives the working history of a miner at a copper mine:</p> <table border="1"> <thead> <tr> <th>Nature of work</th> <th>Number of months worked</th> <th>Average dust production in the respirable size range (<math>\text{mg}/\text{m}^3</math>)</th> <th>Percentage of free silica in the respirable dust</th> </tr> </thead> <tbody> <tr> <td>Drilling</td> <td>39</td> <td>1.8</td> <td>5.6</td> </tr> <tr> <td>Mucking</td> <td>48</td> <td>2.4</td> <td>8.2</td> </tr> <tr> <td>Drill shop</td> <td>85</td> <td>0.9</td> <td>4.8</td> </tr> <tr> <td>Surface</td> <td>72</td> <td>0.4</td> <td>0.5</td> </tr> </tbody> </table> <p>Calculate cumulative dust dosage as well as his average dust exposure of the miner. Assume 150 working hours in a month. Estimate the exposure to dust hazard of the miner. Also find the factor of safety in dust exposure of miner according to the norm.</p>	Nature of work	Number of months worked	Average dust production in the respirable size range ( $\text{mg}/\text{m}^3$ )	Percentage of free silica in the respirable dust	Drilling	39	1.8	5.6	Mucking	48	2.4	8.2	Drill shop	85	0.9	4.8	Surface	72	0.4	0.5				2+2+2+2
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\*End of the Question Paper\*