GUJARAT TECHNOLOGICAL UNIVERSITY
BE - SEMESTER–VI(NEW) EXAMINATION – WINTER 2022

Subject Code:3162207   **Date:14-12-2022**
Subject Name:Mine Ventilation
Time:02:30 PM TO 05:00 PM   **Total Marks:70**
Instructions:
1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**
4. **Simple and non-programmable scientific calculators are allowed.**

			MARKS
Q.1	**(a)**	What are the desirable features of good ventilation system?	**03**
	(b)	How firedamp is detecting by using flame safety lamp? Explain with neat sketch.	**04**
	(c)	Briefly explain the measurement of air quantity with suitable example by Precise traversing method using vane anemometer with neat sketch.	**07**
Q.2	**(a)**	Write the permissible concentration of various gases as per mine regulation.	**03**
	(b)	What do you understand by equivalent orifice? How size of equivalent orifice is determined?	**04**
	(c)	A smooth steel duct 0.65×0.45 m in size circulates 0.6 m^3 of air quantity per second. Calculate the resistance coefficient of the duct and the friction pressure loss in a 130 m length of duct. Assume density of the air is 1.2 kg/m^3 and $\upsilon = 0.16 \times 10^{-4}$ m^2/s.	**07**

OR

	(c)	What do you mean by methane drainage? With a neat sketch, explain "superjacent heading method" of methane drainage.	**07**
Q.3	**(a)**	How Reynolds number is significant for the flow pattern?	**03**
	(b)	What is the minimum quantity of air required to ventilate an underground coal mine district producing 250 tonnes of coal per shift employing a maximum of 150 persons in a shift?	**04**
	(c)	How cooling power of mine air is measured using kata thermometer? Explain with neat sketch.	**07**

OR

Q.3	**(a)**	Discuss "fan laws" in detail.	**03**
	(b)	Discuss the Salient points of Cowards Diagram with neat sketch.	**04**
	(c)	What are the various ventilation structures or flow control devices used in underground mines for regulation and direction of air current? Explain any one in detail.	**07**
Q.4	**(a)**	How natural ventilation is occurred? Explain with neat sketch.	**03**
	(b)	Calculate the percentage of blackdamp present in a mine which gave the following air analysis results; $O_2 = 16.52$ %, $CO_2 = 3.1$ %, $CH_4 = 2.45$ %, and $N_2 = 77.93$ %	**04**
	(c)	What is meant by characteristics curve? Explain characteristics curve of mine fans in series and parallel with neat sketch.	**07**

OR

Q.4	**(a)**	Explain are the factors affecting the economic design of mine airway.	**03**

(b) Compare the centrifugal fan with an axial flow fan. **04**

(c) The average air velocity as measured in a 2 m diameter smooth-lined airway is 0.02 m/s. what is the maximum velocity of flow and where does it occur in the airway? If the average velocity is raised to 0.5 m/s, what would be the maximum velocity of air? **07**

Take $\upsilon = 0.16 \times 10^{-4}$ m^2/s

Q.5 (a) Explain the conditions in which booster fan is installed. **03**

(b) Explain the ventilation system or air distribution in Shrinkage stoping method with neat sketch. **04**

(c) Air temperature in downcast and upcast shafts 440 m deep is 28˚C and 34˚C respectively. Calculate the height of motive column. Also find out the density of downcast air and the amount of natural ventilation pressure (N.V.P). Assuming the average barometric pressure in downcast shaft to be 750 mm of Hg. **07**

OR

Q.5 (a) How performance of axial flow fan is varies with changing pitch? **03**

(b) Calculate the pressure developed by a backward bladed centrifugal fan having the following specifications: **04**

Fan Diameter – 3.4 m, RPM – 350, Blade angle – 40 degree, Velocity of flow – 4.8 m/s

Air density – 1.2 kg/m^3, width at periphery – 1.5 m

(c) What do you understand by boundary ventilation system? Explain with neat sketch. **07**

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