Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VI (NEW) EXAMINATION – WINTER 2023

Subject Code:3162207 Date:05-12-2023

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 is the necessity and standard of ventilation?	**03**
	(b)	Describe the methods of detecting carbon dioxide gas in an underground mine.	**04**
	(c)	Explain about Firedamp in details with its detection by flame safety lamp.	**07**
Q.2	**(a)**	What is blackdamp? Explain briefly.	**03**
	(b)	Discuss the physiological effect of carbon monoxide gas in mines.	**04**
	(c)	Write a brief note on Frictional resistance and Shock resistance.	**07**
		OR	
	(c)	What do you mean by methane drainage? With a neat sketch, explain "Cross-measures method" of methane drainage.	**07**
Q.3	**(a)**	What are the recommendations of air velocity required at various places of underground mine as per CMR 1957?	**03**
	(b)	Discuss the Salient points of Cowards Diagram with neat sketch.	**04**
	(c)	What is relative humidity? How relative humidity is measured using whirling hygrometer? Explain briefly with neat sketch.	**07**
		OR	
Q.3	**(a)**	Differentiate between the term laminar & turbulent flow.	**03**
	(b)	What do you understand by kata thermometer? Explain with neat sketch.	**04**
	(c)	How is natural ventilating pressure produced? Derive the equation of natural ventilation pressure from air density.	**07**
Q.4	**(a)**	What do you understand by auxiliary ventilation? Explain with neat sketch.	**03**
	(b)	An underground face is ventilated with 70 m^3 of air per minute containing 20.93 % O_2, 0.03% CO_2 and 79.04% N_2. A man when doing hard work in a confined space consumes 3.5 m^3 of O_2 and produces 1.3 m^3 of CO_2 per minute. Calculate the percentage composition of return air. Assume the parameters if required.	**04**
	(c)	Discuss the effect of heat & humidity at the work places.	**07**
		OR	
Q.4	**(a)**	Explain are the factors affecting the economic design of mine airway.	**03**
	(b)	Explain centrifugal fan in detail.	**04**
	(c)	The analysis of a mine air sample are reported as follows: O2 = 18.55 % CO2 = 2.45 % CH4 = 2.5 % N2 = 76.5 % Calculate the percentage of mine air and blackdamp as well as the composition of blackdamp.	**07**
Q.5	**(a)**	Discuss the resistance of airways in series and parallel.	**03**
	(b)	Write a short note on ventilation survey in underground mine.	**04**
	(c)	Air temperature in downcast and upcast shafts 465 m deep is 29˚C and 36˚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)**	What do you mean by Evasee? Discuss its importance.	**03**
	(b)	Calculate the pressure required to circulate 2400 m3 per minute of air through a 2500m long tunnel of 3.5 × 3.0 m cross-section with k = 0.0098 Ns2m-4.	**04**
	(c)	Write a brief note on axial flow fan with neat sketch.	**07**

****