GATE – Mining Engineering

(Topic Wise Questions 2007-2017)

Topic: Surface Mine Environment

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GATE SYLLABUS:

Ventilation, Underground Hazards and Surface Environment:

Underground atmosphere; Heat load sources and thermal environment, air cooling; Mechanics of air flow, distribution, natural and mechanical ventilation; Mine fans and their usage; Auxiliary ventilation; Ventilation planning.

Subsurface hazards from fires, explosions, gases, dust and inundation; Rescue apparatus and practices; Safety in mines, accident analysis, noise, mine lighting, occupational health and risk.

Air, water and soil pollution: causes, dispersion, quality standards, reclamation and control.

2007

Q.11 In the Gaussian plume model, the dispersion coefficients are function of

(A) distance from source and stability class
(B) stack height and distance from source
(C) stability class and source coordinates
(D) source coordinates and distance from source

Q.16 The most recent model of self-contained compressed-oxygen breathing apparatus is

(A) Proto-IV   (B) BG-174   (C) BG-4   (D) BG-174A

Q.52 An effluent sample is diluted with fresh water to make up a solution of 300 ml. The DO of the solution initially is 8.0 mg/l and the value falls to 3.0 mg/l after 5 days. If the 5-day BOD of the original effluent is known to be 50 mg/l, the amount of fresh water added in ml to the solution is

(A) 270   (B) 160   (C) 54   (D) 30

Q.53 With respect to stack emission the phenomenon of fumigation is noticed in case of

(A) atmospheric lapse rate being lower than the adiabatic lapse rate
(B) atmospheric lapse rate being higher than the adiabatic lapse rate
(C) temperature inversion in the atmosphere above the stack height
(D) temperature inversion in the atmosphere below the stack height

2008

Q.16 Electrostatic precipitator works on the principle of

(A) Capacitance change   (B) Ionization of the particles
(C) Electro heating of gases   (D) Centrifuging the gaseous molecules

Q.35 Precipitation of metallic ions in mine water drainage is carried out by

(A) $CaSO_4$ and $MgSO_4$ (B) $CaCO_3$ and $MgCO_3$
(C) $Ca(OH)_2$ and $NaOH$ (D) $CaCO_3$ and $MgSO_4$

Q.44 A roadheader district produces 20 mg/ m³ of airborne dust with the following size distribution:

Size up to	Cumulative wt %
1 μm	1
5 μm	5
10 μm	10
20 μm	20
50 μm	50
> 50 μm	100

The concentration of respirable fraction of dust in mg/m³ is

(A) 0.2   (B) 2.0   (C) 10.0   (D) 1.0

Statement for Linked Answer Questions 78 and 79: Mine water flowing at 1.5m³/s with 2 mg/l dissolved oxygen, joins river water flowing at 7m³/s containing 6mg/l dissolved oxygen.

Q.78 The dissolved oxygen concentration of the mixture in mg/l is

(A) 5.3   (B) 4.8   (C) 4.2   (D) 3.9

Q.79 The saturated value of the dissolved oxygen in the mixture is given to be 9.3mg/l. On this basis, the initial oxygen deficit of the mixture in mg/l is

(A) 2.4   (B) 4.0   (C) 6.8   (D) 14.6

2009

Q.15 Moody diagram represents resistance coefficient in terms of

(A) Reynolds number and asperity ratio   (B) viscosity and aspect ratio

(C) surface tension and viscosity   (D) Reynolds number and surface tension

Q.48 In an area within a surface mine, under static condition the following gases are found: NO_2, CO_2, O_3 and SO_2. Assuming no diffusion, reaction and bonding of the gases, the concentration of the gases from bottom upwards will be in the order of

(A) NO_2, CO_2, O_3 and SO_2
(B) SO_2, NO_2, CO_2 and O_3
(C) SO_2, O_3, NO_2 and CO_2
(D) NO_2, CO_2, SO_2 and O_3

2011

Q.11 The whole circle bearing of the line AB is $116^{\circ}20'20''$. If there exists an east declination of 20°, the true quadrantal bearing of line AB is

(A) $S41^{\circ}59'40''E$ (B) $S43^{\circ}39'40''E$ (C) $S45^{\circ}59'40''W$ (D) $S47^{\circ}59'40''W$

Q.12 It is proposed to connect two straights of a road by a simple circular curve. If the maximum speed of the vehicle is 60 km/h and the centrifugal ratio for the road is 1/4, the minimum radius of the curve in m is

(A) 113.26   (B) 98.18   (C) 25.46   (D) 15.50

Q.20 ISO 9000 Quality Systems **DO NOT** contain

(A) legal provisions   (B) measurement   (C) document control   (D) standardization

Q.23 100 ml of waste water is allowed to evaporate in a dish weighing 48.6232 g. The weight of the dish with dry solids is 48.6432 g. The concentration of dry solids in waste water in mg/l is

(A) 200   (B) 220   (C) 260   (D) 320

2012

Q.35 A spherical droplet of water, with density 1000 kg/m^3 and diameter of 1 μm, is falling in air. The viscosity of air is 1.85×10^{-5} kg/m·s. Neglecting air density and assuming that the settling of droplet in air follows Stokes' Law, the settling velocity in m/s is

(A) 0.98×10^{-5} (B) 2.95×10^{-5} (C) 8.04×10^{-5} (D) 53.03×10^{-5}

2013

Q.27 In an experiment to determine specific gravity of a soil sample, the following data is obtained:

Mass of empty pycnometer	20.4 g
Mass of pycnometer with soil sample	51.6 g
Mass of pycnometer with soil sample filled with water	88.6 g
Mass of pycnometer filled with water	70.4 g

The specific gravity of the sample is _____

2014

Q.20 A mine waste dump of pH 5.2 can be neutralized by adding

(A) urea   (B) calcium carbonate

(C) sulphuric acid   (D) sodium chloride

2015

The temperature of a parcel of air decreases from $30.2°$C to $28.9°$C as it rises from an altitude of 20 m to 120 m. The lapse rate for the atmosphere is

(A) subadiabatic   (B) adiabatic   (C) superadiabatic   (D) transadiabatic

Options :

1. ✖ A
2. ✖ B
3. ✔ C
4. ✖ D

Question Number : 23 Question Type : MCQ

In a BOD test, 5 ml of wastewater is diluted with pure water to fill a 300 ml BOD bottle. The initial and final dissolved oxygen contents of the mix are 9.0 mg/l and 7.0 mg/l respectively. The BOD of the wastewater, in mg/l, is

(A) 2   (B) 10   (C) 120   (D) 600

Options :
1. ✖ A
2. ✖ B
3. ✔ C
4. ✖ D

2016

Q.21   Identify the WRONG statement.
The 'temperature inversion' of the atmosphere in surface mines aggravates the problem of

(A) airborne dust
(B) noise
(C) ground vibrations
(D) visibility

2017

The "yellow boy" formed due to acid mine drainage mainly consists of

(A) Ferrous hydroxide
(B) Ferrous sulfate
(C) Ferric hydroxide
(D) Ferric sulfate

A stream flowing at 15 m^3/s has a tributary feeding into it with a flow rate of 7 m^3/s. The concentrations of chloride at the upstream of the junction and that of the tributary are 30 mg/L, and 50 mg/L respectively. Treating chloride as conservative substance and assuming complete mixing of two streams, the concentration of chloride in mg/L at the downstream is _____

A sample of mine water has 100 mg/L of Ca^{2+} and 10 mg/L of Mg^{2+}. The equivalent weights of Ca^{2+} and Mg^{2+} are 20 mg/meq and 12.2 mg/meq respectively. The hardness of mine water in unit of mg/L as $CaCO_3$ is _____