

22252

24225

3 Hours / 70 Marks

Seat No.

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- Instructions :**
- (1) All Questions are *compulsory*.
 - (2) Answer each next main Question on a new page.
 - (3) Illustrate your answers with neat sketches wherever necessary.
 - (4) Figures to the right indicate full marks.
 - (5) Assume suitable data, if necessary.
 - (6) Use of Non-programmable Electronic Pocket Calculator is permissible.
 - (7) Mobile Phone, Pager and any other Electronic Communication devices are not permissible in Examination Hall.

Marks

1. Attempt any FIVE of the following :

10

- (a) Define the following damps found in mines :
 - (i) Fire damp
 - (ii) Stink damp
- (b) Write the classification table of coal mines as per the degree of gasiness.
- (c) State the safety features of a flame safety lamp (any four).
- (d) Define the following terms :
 - (i) Natural ventilation
 - (ii) Geothermic gradient



- (e) Define : Motive column and give its formula.
- (f) Define the following terms :
 - (i) Exhaust fans
 - (ii) Forcing fans
- (g) Define : Equivalent orifice and give its formula.

2. Attempt any THREE of the following :

12

- (a) State the constructional features of a flame safety lamp with their functions.
- (b) State the standards of ventilation as per CMR 2017.
- (c) State and explain the factors causing natural ventilation pressure (N.V.P.).
- (d) Explain the following in detail w.r.t. fans :
 - (i) Theoretical depression
 - (ii) Manometric efficiency

3. Attempt any THREE of the following :

12

- (a) Explain the procedure to determine the cooling power of mine air using Kata Thermometer.
- (b) Explain the effect of seasonal changes on the direction of natural ventilation.
- (c) Compare : Axial flow fans V/s Centrifugal fans (any 4 points).
- (d) State merits and demerits of :
 - (i) Ascensional ventilation
 - (ii) Descensional ventilation

4. Attempt any THREE of the following :**12**

- (a) Explain the following combination of Fans with their respective graphs :
 - (i) Fans in series
 - (ii) Fans in parallel
- (b) Explain the following w.r.t. Auxiliary ventilation :
 - (i) Definition & whereabouts
 - (ii) Hazards associated
- (c) Give a brief on the scope and importance of ventilation survey.
- (d) Write a note on : Pitot Static Tube.
- (e) Explain in brief the following :
 - (i) Places where air measurements are to be taken.
 - (ii) Precautions required during conduction of ventilation surveys.

5. Attempt any TWO of the following :**12**

- (a) Describe construction & working of MSA methanometer with neat diagram.
- (b) Describe effect of heat and humidity on miners.
- (c) Calculate the water gauge (w.g.) produced by a 3 m dia. fan running at 250 r.p.m. and delivering 6000 m³/min of air, if the blades are :
 - (i) Radial
 - (ii) Bent backward at 35°,
 - (iii) Bent forward at 35°

Assume, velocity of air flow = 3 m/s

Air density = 1.2 kg/m³

6. Attempt any TWO of the following :**12**

- (a) The mean air temperature in a D.C. shaft 450 m deep is 32 °C and in the U.C. shaft is 40 °C.

Calculate :

- (i) The motive column
- (ii) The N.V.P.

Assume, average barometric pressure in D.C. shaft to be 750 mm of Hg.

- (b) A total quantity of 100 m³/min of air is passing through two splits. One airway is 2.5 m × 1.5 m and 100 m long and the other, with similar lining, is 2 m × 1.5 m and 125 m long.

Calculate the quantity of air passing in each split.

- (c) Illustrate the conventions for the preparation of plans and sections as per CMR 2017 :

- (i) Abandoned shaft
 - (ii) Goaf
 - (iii) Surface contour
 - (iv) Explosion-proof air crossing
 - (v) Water dam
 - (vi) Section of seam
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