

[Time: 3 Hours]

[Marks:80]

Please check whether you have got the right question paper.

- N.B:
1. Question No.1 is compulsory.
 2. Attempt any **Three** out of remaining questions.
 3. Assume any suitable data if necessary and indicate it clearly.
 4. Draw neat sketches wherever required.
 5. Answer to the sub-questions of an individual question should be grouped and written together i.e. one below the other.
 6. Steam Tables can be referred.

Q.1 Explain any one of the relief system with diagram. 5

Determine the TLV for a uniform mixture of dusts containing the following particles 5

Type of Dust	Concentration (wt %)	TLV(mppcf)
Dust A	70	20
Dust B	30	2.7

A process has a report FAR of 2.If an employee works a standard of 8-hr shift 300 days per year, compute the death per person per year. 5

Performance of boilers is checked by which parameters?-Explain. 5

Q.2 a Write on disaster of Bhopal Gas plant from the perspective of Technical Failures and Consequences. 10

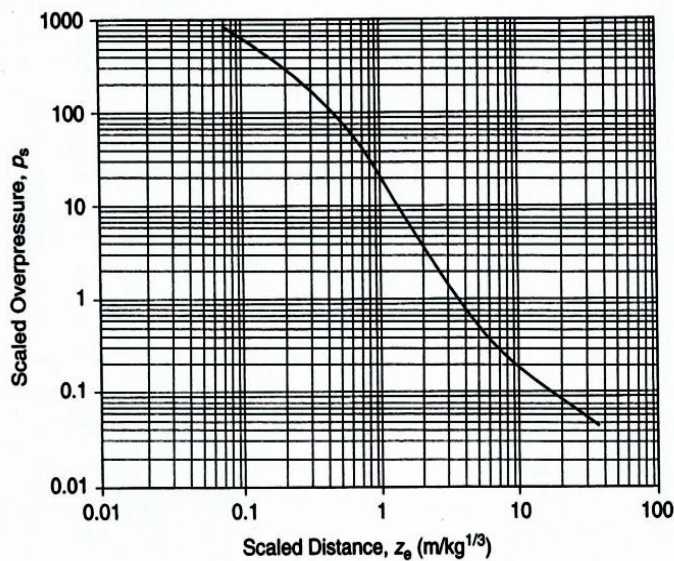
b If the UFL for a substance is 11.0 % by volume at 0 MP gauge, what is the UFL at 6.2 gauge? 4

c Define: - (i) Detonation (ii) Deflagration (iii) Confined explosion (iv) Unconfined explosion. 6

Q.3 a What are the main tasks of Industrial hygienist? Explain Anticipation and identification in detail with examples. 10

b Xylene is used as a solvent in paint. A certain painting operation evaporates an estimated 3 gal of xylene in an 8-hr shift. The ventilation quality is rated as average. Determine the quantity of dilution ventilation air required to maintain the xylene concentration below 100 ppm, the TLV-TWA. Also, compute the air required if the operation is carried out in an enclosed hood with an opening of 50 ft² and a face velocity of 100 ft./min. The temperature is 77°F and the pressure is 1 atm. The specific gravity of the xylene is 0.864, and its molecular weight is 106. k = 0.125. 10

- Q.4 a Describe how HAZOP is carried out. Write its checklist. 10
 b 10



One Thousand kilogram of methane escapes from a storage vessel, mixes with air, and explodes. Determine (a) The equivalent amount of TNT and (b) the side on peak overpressure at a distance 50 m from the blast. Assume an explosion efficiency of 2 %. ΔH_c for Methane is 802.3 kJ/mol and the energy of explosion of TNT is 4686 kJ/kg.

- Q.5 a A certain quantity of steam in a closed vessel of fixed volume of 0.14 m³ exerts a pressure of 10 bar at 250 C. If the vessel is cooled so that the pressure falls to 3.6 bar, determine: (a) the final quality of steam, (b) the final temperature, (c) the change in internal energy, and (d) the heat transferred during the process. Take C_p for superheated steam as 2.1 kJ/kg K. 10
 b Explain one of the mounting and one of the accessories used with boilers using diagrams. 10

- Q.6 a Derive equation for work done per kg of air delivered for single acting reciprocating 10
 compressor with clearance volume.
 b A single stage double acting reciprocating air compressor delivers 14 m³/ min air at 1.01325 10
 bar and 288 K. The pressure and temperature of air during suction are 0.95 bar and 305 K.
 The delivery pressure is 0.7 MPa. Assuming compression and expansion follow the law
 $PV^{1.3} = C$, taking clearance 5% of stroke, determine
 1. I. P. required to run the compressor
 2. Volumetric Efficiency
