Total No. of Questions : 8] *[Total No. of Printed Pages : 3*

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FT-8003 (1) (CBGS)

B.E. VIII Semester

Examination, November 2019

Choice Based Grading System (CBGS)

Hazardous Material Management

Time : Three Hours

Maximum Marks : 70

Note: i) Attempt any five questions.
ii) All questions carry equal marks.
iii) In each question all parts are compulsory.
iv) All parts of each question are to be attempted at one place.

1. a) Describe the different organs of respiratory system and explain the effect of chemical exposure on respiratory system for following gases: 7
   i) Ammonia (NH_3)
   ii) Chlorine (Cl_2)
   b) Give the details description on hypersensitivity? Explain the causes of hypersensitivity occurrences at work places? 7

2. a) An employee works in a plant with a FAR of 4. If this employee works a 4-hr shift, 200 days per year, what is the expected death per person per year? 7
   b) A group of 100 people is exposed to phosgene in two consecutive periods as follows: 7
   i) 10 ppm for 30 min
   ii) 1 ppm for 30 min.
   Determine the expected number of fatalities

3. a) Derive the equation for atmospheric stability classes in downwind, crosswind and vertical direction? 7
   b) You have been suddenly enveloped by a plume of toxic material from a nearby chemical plant. Which way should you run with respect to the wind to minimize your exposure? 7

4. a) Demonstrate the model for mass flow rate of the following condition of source model: 7
   i) Flow of liquid through a hole
   ii) Flow of liquid through a hole in a tank
   iii) Flow of vapor through hole
   iv) Flow of flashing liquids.
   b) How dispersion models of hazardous materials are useful in on site emergency preparedness, explain with suitable example. 7

5. a) Describe the procedure for the measurement of LEL and UEL? What are the various sources of inaccuracy which influences the measurement of flash points? 7
   b) Fires and explosions are substantial hazards in many chemical plants. 7
   i) Describe with examples the three ingredients of any fire
   ii) Create a checklist with a least six items to identify fire hazards in any workplace.
   iii) List six common fire prevention protection features for chemical plants, and describe when they would be appropriate?

6. a) Explain Vacuum purging procedure with the help of Vacuum purge cycles? 7
   b) What bonding and grounding procedures must be followed to transfer a drum of flammable solvent into a storage tank? 7

7. Chlorine is used in a particular chemical process. A source model study indicates that for a particular accident scenario 1.0 kg. of chlorine will be released instantaneously. The release will occur at ground level. A residential area is 500 m away from the chlorine source. Determine. 14

   i) The time required for the center of the cloud to reach the residential area. Assume a wind speed of 2 m/s.

   ii) The maximum concentration of Chlorine in the residential area. Compare this with a TLV for chlorine of 0.5 ppm. What stability conditions and wind speed produces the maximum concentration?

   iii) Determine the distance the cloud must travel to disperse the cloud to a maximum concentration below the TLV. Use the conditions of Part (ii).

8. a) Differentiate between deflagration and detonation based on energy release in the successive events. 7

   b) Classify the type of explosion in process industries. 7

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