Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

M. E. Sem. – II[nd] - Examination – June/July- 2011

Subject code: 1723005

Subject Name: Environment and Safety Management

Date:29/06/2011 **Time: 10:30 am – 01:00 pm**

Total Marks: 70

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

Q.1 **(a)** What are pressure relief devices? Classify them. Explain working of rupture disk with a neat sketch. **07**

(b) Explain hydrometallurgical treatment process for extraction of metals from PCB's using conventional leachants with a neat sketch. **07**

Q.2 **(a)** A reactor with 3500 gallon capacity with styrene monomer undergoes adiabatic polymerization after being heated inadvertently to 70°C. The maximum allowable working pressure (MAWP) of the vessel is 5 bar. Given the data below, determine the relief vent diameter required. Assume a set pressure of 4.5 bar and a maximum pressure of 5.4 bar absolute. **07**

Data: Volume (V) = 3500 gal.
Reaction mass (m_o) = 9500 kg
Set Temperature (T_s) = 209.4°C

Data from VSP: Maximum Inlet Temperature (T_m) = 219.5°C
$(dT/dt)_S$ = 0.493K/sec
$(dT/dt)_m$ = 0.662 K/sec

Physical Property data:

	4.5 bar set	5.4 bar peak
v_t (m^3/kg)	0.001388	0.001414
v_g (m^3/kg)	0.08553	0.07278
C_p (KJ/kgK)	2.470	2.514
ΔH_v (KJ/kg)	310.6	302.3

(b) Discuss the Construction and working of landfill site for hazardous and non-hazardous material with neat sketches. **07**

OR

(b) What is sampling methodology? Discuss the method of determining emissions of Carbon monoxide from stationary sources with a neat sketch. (EPA method 10). **07**

Q.3 **(a)** What is Environmental audit? In what way it is beneficial to Industry? **07**

(b) Explain Post-Audit activities for Environment Audit in brief. **07**

OR

Q.3 **(a)** Discuss the method of determining emissions of nitrogen oxides from stationary sources with a neat sketch.(EPA method 7) **07**

(b) Design an incinerator to burn hydrocarbon at a rate of 30 m^3/hr with hydrocarbon concentration of 0.1%. Assume reaction to be first order. Fuel used for destructing gases is natural gas. **07**

Data:
Inlet temperature: 66°C (150°F)
Combustion temperature: 650°C (1200°F)
Initial Concentration : 10%
Activation Energy (E): 2000 cal/gmmol
Exponential constant (A): 35 sec^{-1}
Universal gas constant gas: (R): 1.987 cal/gm°C
Heating value of natural gas: 9425 Kcal/m^3(1059 Btu/ft^3)
Velocity of gas: 10 m/sec
Specific heat of hydrocarbon concentration: 2.35 KJ/kgK
Density of hydrocarbon gas at 66°C (150°F): 0.4 kg/m^3

Q.4 **(a)** Give the types of equipments for Effluent Relief Device for Collection and handling. Explain horizontal blow-down for Effluent Relief Device for Collection and handling with help of neat figure. **07**

(b) What are flame arresters? Explain the working of "Detonation Arresters" with the help of a neat sketch. **07**

OR

Q.4 **(a)** Explain the design for low pressure tanks for storage of organic liquids. **07**

(b) Discuss the selection criteria for storage and handling of Hazardous material in underground tanks. **07**

Q.5 **(a)** What are the restrictions on filling, manufacture and import in SMPV rules? **07**

(b) What is exempted in SMPV rules? What are the special precautions to be taken against accidents during repair in SMPV rules? **07**

OR

Q.5 **(a)** List out the applications and performance characteristics of horizontal blow-down drum, cyclone separator and Quench tank for emergency relief device effluent collection. **07**

(b) List out and explain the selection criteria for flame arresters. **07**

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