Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

M. E. - SEMESTER – II • EXAMINATION – SUMMER • 2014

Subject code: 1723005 Date: 23-06-2014

Subject Name: Environmental and Safety Management

Time: 02:30 pm - 05:00 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)**	Describe nine mandatory markings on pressure vessels as The Static and Mobile Pressure Vessels (Unfired) Rules 1981.	**07**
	(b)	Define and describe Environmental Management System.	**07**
Q.2	**(a)**	Enlist Pollution Detection equipment as per Environmental Audit Scheme.	**07**
	(b)	Differentiate between ñHazardò and ñRiskò	**07**
		OR	
	(b)	Explain Post-Audit activities for Environment Audit in brief.	**07**
Q.3	**(a)**	Describe safety interlocks and Process actions with respect to interlocking system in chemical process plant.	**07**
	(b)	Enlist the benefits of physically separating the safety interlock system from the process controls.	**07**
		OR	
Q.3	**(a)**	Explain simple random sampling, stratified random sampling, systematic sampling and cluster sampling with respect to sample collecting system for hazardous material.	**07**
	(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.4	**(a)**	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. Data: Inlet temperature: 66°C (150°F) Combustion temperature: 650oC (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 oC Heating value of natural gas: 9425 kcal/m3(1059 Btu/ft3) Velocity of gas: 10 m/sec Specific heat of hydrocarbon concentration: 2.35 KJ/kg-K Density of hydrocarbon gas at 66°C (150°F): 0.4 kg/m3	**07**
	(b)	Enlist the purposes of using flame arrestor, also enlist the common process vessel where flame arrestor is used.	**07**
		OR	
Q.4	**(a)**	A sanitary landfill is being designed to handle solid waste generated by a town having a population of 1,00,000. The waste generation on the average is 0.3kg/person/day. It is expected that the waste will be delivered by a truck to the landfill site on a 4 day/week basis. The mean density of the refuse spread is 100 kg/m3. The solid waste is spread in 1.5 m layers and compacted to 0.3 m. The landfill will use 0.15 m of soil for daily cover. An intermediate cover of	**07**

soil of 0.2 m is used to complete the cell and a final cover 1.0 m over the stack of 2 cells is recommended. Calculate the following:
1. Annual volume required for the landfill.
2. Annual horizontal area covered by the solid waste.

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

Q.5 **(a)** Discuss the selection criteria for storage and handling of Hazardous material in underground tanks. **07**

(b) Enlist recent solid waste treatment methods. **07**

OR

Q.5 **(a)** Discuss the construction and working of thermal incinerator with its advantages and disadvantages. **07**

(b) What is e-waste? Give types of e-waste. List out various methods for e-waste treatment and disposal and explain any one in detail. **07**

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