



Name : .....

Roll No. : .....

Invigilator's Signature : .....

**CS/M.TECH(CHE)/SEM-2/CHE-13C/2012**

**2012**

**INDUSTRIAL POLLUTION CONTROL**

Time Allotted : 3 Hours

Full Marks : 70

*The figures in the margin indicate full marks.*

*Candidates are required to give their answers in their own words  
as far as practicable.*

Answer any *five* questions taking at least one from each Module.

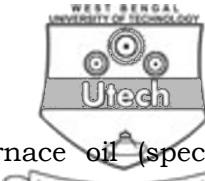
$$5 \times 14 = 70$$

**Module : I**

1. a) Discuss the methodology of analysis of Carbon monoxide.  
b) A venturi scrubber is to be used to collect particulate matter from an industrial operation. The liquid flow rate through the scrubber is  $2.62 \text{ m}^3/\text{hr}$  per  $28.32 \text{ m}^3$  per min of the gas and the relative velocity of the gas to liquid is  $91.44 \text{ m/sec}$ . The gas is air at standard temperature of  $298\text{K}$  and the pressure of  $1 \text{ atm}$  carrying particles of density  $1000 \text{ kg/m}^3$ . 6 + 8
2. a) Discuss the principle and operation of a RSPM sampler (preferably NEERI/Envirotech design) along with a neat sketch.

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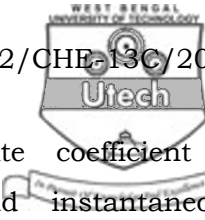
- b) A factory uses 300000 litres of furnace oil (specific density 0.97) per month. If for 1 million litres of oil used per year, the particulate matter emitted 4.3 tonnes per year,  $\text{SO}_2$  emitted is 79.5 tones per year,  $\text{NO}_x$  emitted is 10.5 tonnes per year, hydrocarbon emitted are 0.50 tonnes per year, carbon monoxide emitted is 0.67 tonnes per year, calculate the height of the chimmey required to be provided for safe dispersion of the pollutant. 9 + 5

### Module : II

3. a) Discuss the essential features of Extended Aeration System.
- b) Prepare preliminary designs for a rotating disc type installation to serve 1000 persons. Assume 80% BOD removal at an organic load of 20 g BOD/m<sup>2</sup>-day and 3 m diameter discs, spaced 5 cm apart on centres. 6 + 8
4. a) Compute L and k using Fujimoto method for the following BOD data reported for a stream receiving some treated effluent :

t, d	2	4	6	8	10
y, mg/L	11	18	22	24	26

- b) A waste water treatment plant discharges 1.0 m<sup>3</sup>/s of effluent having an ultimate BOD of 40.0 mg/L, into a stream flowing 10.0 m<sup>3</sup>/s. Just upstream from the discharge point, the stream has an ultimate BOD of



3.0 mg/L. The deoxygenation rate coefficient is 0.22/day. Assuming complete and instantaneous mixing, find ultimate BOD of the mixture of waste and river just downstream from the outfall. Assuming a constant cross-sectional area for the stream equal to 55 m<sup>2</sup>, what ultimate BOD would you expect to find at a point 10,000 m downstream ? 7 + 7

**Module : III**

5. State briefly the Environment Management Plan of the following industries (any two) : 2 × 7 = 14

- a) Pulp and paper industries
- b) Pesticides
- c) Fertilisers

6. What is bio-remediation ? Suggest a methodology of adatement of pollution in tanneries by bioremediation taking into consideration of appropriate growth kinetics. Outline also the design aspect of a bio-reactor used for this purpose.

2 + 6 + 6

**Module : IV**

7. a) Water Prevention and Control of Pollution Act, 1974 basically emphasized the formation of apex body for controlling the domestic and industrial pollution aspects of out country. Discuss critically the statement.



- b) State Air Act, 1981
- c) State the categories of industries in connection with consent to establish for new units according to the apex body giving clearance for Indian industries.
- d) According to CPCB standard, state and explain the criteria of Class B type of water bodies.
- e) Discuss the practice to be followed while handling Bio-medical waste by medical establishments in metropolitan cities of India. 3 + 2 + 3 + 3 + 3
8. a) A chemical engineering industry has retained you as a consultant for preparation and ultimate steps for ISO 14000 certification. Please prepare the basic activity chart for this operation.
- b) Explain in brief the concept and basic aspects of EIA before setting up an industrial establishment. 8 + 6
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