53 (FPT 501) FIWM

2014

FOOD INDUSTRIES WASTE MANAGEMENT

Paper : FPT 501

Full Marks : 100

Time : Three hours

The figures in the margin indicate full marks for the questions.

*Answer **any five** questions out of **seven** given.*

1. *(a)* Define solid waste management. Explain different sources and types of solid wastes. 10

   (b) What are the different methods for treatment of solid wastes ? Briefly explain the pyrolysis process. 10

2. *(a)* Discuss briefly about composting and vermi-composting. What are the advantages of vermi-composting ? 10

(b) Before composting aerobically, the empirical formula for a particular solid waste was determined as $(C_6H_{10}O_5)_7$. If 60% of the solid waste is decomposed, calculate the number of moles of oxygen that are required per mole of waste decomposed. 10

3. (a) Describe briefly the major steps involved in Activated Sludge Process. What is Solid Retention Time (SRT) ? How can you define Mean Cell Residence Time (MCRT) ? 10

(b) Derive the relationship between BOD_U and BOD_5. 3

(c) Determine the 1-day BOD and ultimate first stage BOD for a waste water whose 5-day 20°*C* BOD is 300*mg/l*. The reaction constant *K* (base) = $0{\cdot}23d^{-1}$. What would have been the 5-day BOD, if the test had been conducted at 25°*C* ? 7

4. Differentiate between : 4×5=20

(a) BOD and BOD_5

(b) Coagulation and flocculation

(c) Incineration and Gasification

(d) Aerobic composting and anaerobic composting.

5. *(a)* What is RBC (Rotating Biological Contactors) ? Discuss the working principles of RBC. Write the advantages and disadvantages of RBC. 12

(b) Explain Bio-filtration phenomenon of liquid industrial sewage. What is the controlling mechanism of a bio-filter ? 8

6. *(a)* Explain the working principle of Trickling filter technique for treatment of waste water. 10

(b) A $10m$ diameter single stage trickling filter at a depth of $6{\cdot}1m$. Primary effluent with the characteristics given below is applied to the filter. What is the Volumetric BOD and TKN loading ? Calculate also specific TKN loading. 10

Data given are

Flow rate $= 4500 m^3/d$

BOD $= 120 g/m^3$

TSS $= 80 g/m$

TKN $= 25 g/m^3$

Specific surface area of the packing material (plastic) $= 90 m^2/m^3$

7. *(a)* Estimate theoretically the volume of biogas and their percentage that can be produced by anaerobic treatment of 1000*kg* of solid waste by using following data 12

Chemical formula of BVS $= C_{60}H_{95}O_{40}N$

VS in solid waste $= 80\%$

Moisture content $= 20\%$

Biodegradable VS $= 95\%$ (dry basis)

Specific weight of methane $= 0 \cdot 7112\, kg/m^3$

Specific weight of $CO_2 = 1 \cdot 9607\, kg/m^3$

(b) Explain briefly about Lagoons and UASB for waste-water treatment. 8