Reg. No. : | | | | | | | | | | | | |

Question Paper Code : 20281

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2018.

Sixth Semester

Civil Engineering

CE 6605 — ENVIRONMENTAL ENGINEERING – II

(Regulations 2013)

(Common to : PTCE 6605 – Environmental Engineering – II for B.E. (Part-Time) – Fifth Semester – Civil Engineering – Regulations – 2014)

Time : Three hours | Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What are the various sources of waste water generation?
2. Define BOD.
3. What are small bore systems?
4. Why are sewers circular?
5. What do you mean by grey water?
6. What is onsite sanitation?
7. What is oxidation ditches?
8. What do you mean by UASB?
9. What are the disadvantages of land disposal of wastes?
10. Draw the rough plot of oxygen sag curve under the influence of mild, heavy and gross pollution.

PART B — (5 × 13 = 65 marks)

11. (a) Name any 5 physical characteristics of waste water and explain in short with reference to any five physical characteristics of waste water.

Or

(b) Define dry weather flow. Explain the various sources of dry weather flow of sewage and also write short notes on various factors that affect the dry weather flow.

12. (a) From a topographic map and field survey, the area of the drainage basin upstream was found out to be 35 hectares. Determine the maximum rate of run-off for a 10 year. The length of overflow slope is 45 meter with an average overland slope of 2%. The length of main basin channel is 700 meter with a slope of 1.8%. Ratio of area and perimeter is found out to be 0.6 meters. Take mannings roughness coefficient to be 0.09 and total runoff coefficient to be 0.35.

Or

(b) A combined sewer was designed to serve an area of 60 sq. km with an average population density of 185 persons/hectare. The average rate of sewage flow is 350 L/Capita/day. The maximum flow is 50% in excess of the average sewage flow. The rainfall equivalent of 12 mm in 24 h can be considered for design, all of which is contributing to surface runoff. What will be the discharge in the sewer? Find the diameter of the sewer if running full at maximum discharge and velocity of 0.9 m/s.

13. (a) What do you mean by primary treatment for sewage treatment and write a short note on bar screens, grid chamber and primary sedimentation tanks.

Or

(b) What is septic tank? Discuss the design features of septic tank in detail.

14. (a) What do you mean by secondary treatment process of sewage treatment? Write short notes on trickling filters, activated sludge process and Oxidation ponds.

Or

(b) Expand UASB and draw the schematic diagram of UASB. Given that the influent to UASB reactor has following characteristics: flow rate = 8000 m^3/day, depth of sludge blanket = 2.2 m, reactor heigt (including settler) = 5 m, effective coefficient (ratio of sludge to total volume in sludge blanket) = 0.85, and average concentration of sludge = 70 kg/m^3. Determine HRT and reactor area. Take BOD removal efficiency as 80% and sludge age as 30 days.

15. (a) Write short notes on lagooning dumping landfilling and incineration of solid wastes.

Or

(b) What do you mean by sludge thickening process? Explain Gravity thickening and air flotation unit with a neat diagram.

PART C — (1 × 15 = 15 marks)

16. (a) Imagine that you have a bio-gas reactor and you are constantly feeding it with food wastes in your home. On an average, you feed 2 kg of food waste daily and obtain around 200 liters of bio gas per day. For next 5 days, you are going to load the following food wastes in the digester. Find out the day in which you can expect the maximum amount of bio gas and explain why? Also explain on what day, you can expect high amount of nitrogen in the bio-gas? (5)

Day	Food waste	Nutrition amount
1	Rice waste, Sāmbhar and curd	Mostly carbohydrates
2	Roti	60% carbohydrates and 10% proteins
3	Fish	50% carbohydrates and around 25% proteins
4	Mixture of rice and Roti	You know it!
5	Sweet potatoes	20% carbohydrates and mostly rest water.

(b) The no of cows (includes bull, ox and buffaloes too) in India is around 30 crores. Biogas can also be produced from cow's dung. In that case, it is called by the name GOBAR GAS. Even today, in rural India, people use dried cow dung for cooking purposes. On an average, a cow gives around 20 kg of cow dung/day, estimate how much energy can be obtained from these animals per year? Find out the no of LPG cylinders equivalent to the total energy obtained from these animals in a year. (10)

USEFUL DATA: Calorific value of LPG is 50 MJ/kg and calorific value of methane is 56 MJ/kg. 1 LPG cylinder contains 15 kg of LPG. 1 kg of cow dung produces around 100 litres of bio-gas with 60% methane content by volume basis. Density of methane is 0.656 kg/m^3.

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