Reg. No. : | E | N | G | G | T | R | E | E | . | C | O | M |

Question Paper Code : 20507

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2023.

Third Semester

Civil Engineering

CE 3303 – WATER SUPPLY AND WASTEWATER ENGINEERING

(Regulations 2021)

Time : Three hours   Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. How the per capita demand of water is estimated?

2. Identify the significance of fluoride in drinking water quality.

3. Under what situation short circuiting occurs in sedimentation tanks? How to avoid it?

4. State the mechanism involved in the aeration process in the removal of iron and manganese.

5. State the necessity of air relief valves provided in water distribution system.

6. Mention an two advantages of centrifugal pumps used in water supply system.

7. Distinguish between dry weather flow and wet weather flow.

8. Identify the need for providing anti-siphonage pipes to be provided in house plumbing.

9. State the objectives of primary treatment of sewage.

10. Mention the imitations of reuse of sewage.

PART B — (5 × 13 = 65 marks)

11. (a) (i) Enumerate the types of surface water sources. Identify the factors governing the selection of sources for water supply projects. (6)

    (ii) In 2000, 2010 and 2020 the population of a town was 25,000, 62,000 and 85,000 respectively. Using geometrical progression method, estimate the population of the town for the year 2025. If the water demand for the town is 150 lpcd, calculate the design capacity of the water distributions system. (7)

Or

    (b) (i) State the importance of bacteriological analysis of water. Outline the steps involved in the most probable number (MPN) test of bacteriological analysis. (7)

    (ii) List the types of intake structures. Enumerate the points to be considered in the selection of site for the intake structures. (6)

12. (a) (i) Distinguish between coagulant aided sedimentation and plain sedimentation. (6)

    (ii) Design a rectangular sedimentation tank to treat 3 million liters of water per day. Adopt surface over flow rate as 24,000 L/day/m²; detention time as 4 hours and length to width ratio as 3:1 (7)

Or

    (b) State the objectives of disinfection in water treatment. List various methods of disinfection process. With neat sketch discuss the breakpoint chlorination and its importance.

13. (a) State the requirements of a good water distribution network. With neat sketch explain the grid iron system and circular or ring system in the water distribution layout with their advantages and disadvantages.

Or

    (b) With neat sketch explain the water supply service connection from the street main to a residential building and state functions of each fittings.

14. (a) Calculate diameter of a combined sewer of circular section laid to serve an area of 100 hectares with a population of 1,00,000 supplied with a water supply of 150 liters per capita per day. Sewer runs one half full at maximum discharge. Assuming an impermeability factor of 0.6 for entire area and time of concentration of rainfall as 20 minutes. Consider 80 % of water supply turns into sewer, peak factor as 3, Manning's constant as 0.013 and permissible slope as 1 in 600.

Or

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(b) (i) A city comprises high dense residential zone, commercial zone, park zone and undeveloped open zone of equal area. Arrange the zones in the order of lowest to highest contribution of storm water runoff. Validate your answer with correct reasoning. (6)

(ii) Outline the phenomenon of crown corrosion in concrete pipe. Mention the methods to prevent it. (7)

15. (a) Illustrate with flow chart the sequence of conventional municipal wastewater treatment system indicating the various units. Discuss the objectives and operation of primary sedimentation tank.

Or

(b) (i) With neat flow chart explain the various components and operation of conventional Activated Sludge Process (ASP). (6)

(ii) Categorize the sources of sludge produced from various stage of conventional wastewater treatment plant. What are the possible forms of resources that can be recovered from the sludge? (7)

PART C — (1 × 15 = 15 marks)

16. (a) In planning a water supply project to a city, summarize the various factors to be considered in following stages; source identification, collection and conveyance, treatment and distribution.

Or

(b) Describe the types of sewerage collection systems indicating the conditions favoring the adoption of each system and their relative merits. During heavy rainfall, sanitary sewer overflow is a major concern in many urban cities. As a sanitary engineer identify the reasons for the above problem and provide possible solutions to reduce or overcome it.

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