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- 13.a) A sewer, having diameter 1.20m, is laid at a gradient of 1 in 400, calculate the velocity of flow and discharge through this sewer when running one-half full. Assume $N = 0.012$ in Manning's formula. 4
- b) Determine the velocity of flow by Empirical formulae. What points should be kept in mind while designing sewers? Explain in detail various steps involved in the design. 6
- 14.a) Design a secondary settling tank for an activated sludge process with the following design data. 7
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|---------------------|---|--------------|
| Average sewage flow | = | 9 Mld |
| MLSS concentration | = | 300 mg / lt. |
| Peak flow factor | = | 2.25 |
| Recycle rate | = | 30% |
- b) Describe briefly about the preliminary treatment using screens. 3
- 15.a) Write short note on collection and recovery of refuse. What are the different methods of disposal of solid refuse? 5
- b) Design a septic tank for 50 users, assuming the rate of water supply as 60 litres / head / day. 5
- 16.a) Take 5 day BOD at 20°C is equal to 250 mg / lt. for three different samples, but the 20°C , K values are equal to 0.12 / day, 0.16 / day and 0.20 / day. Determine the ultimate BOD of each sample. 5
- b) Discuss in detail about the low cost waste treatment comprising of oxidation ponds and RBC. 5
17. Discuss the following in detail. 10
- i) Disinfection – necessity and methods
 - ii) Sewer types and appurtenances
 - iii) Sludge digestion and disposal methods
