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P.E.S. College of Engineering, Mandya - 571 401
(An Autonomous Institution affiliated to VTU, Belgaum)
Sixth Semester, B.E. – Civil Engineering
Semester End Examination; June - 2016
Wastewater Treatment

Time: 3 hrs   *Max. Marks: 100*

Note: i) Answer **FIVE** full questions, selecting **ONE** full question from each unit.
      ii) Missing data (if any) may be suitably assumed.
      iii) Substantiate your answer with neat sketches, whenever necessary.

UNIT - I

1 a. List and discuss on the factors which influences the variation of waste water flow.   10

   b. A population of 30,000 resides in a town with an area of 60 hectares. If the average coefficiency of runoff is 0.60, time of concentration is 30 minutes, calculate the discharge for which the sewers of the proposed combined system will be designed. Assume the water supply as 120 lpcd.   10

2 a. With a neat sketch, explain "Time of concentration" and its significance.   5

   b. Briefly explain self cleansing velocity and non scouring velocity.   5

   c. A 0.60 m diameter sewer having a invert slope of 1 is 200 was flowing full. What would be the velocity of flow and discharge assuming N as 0.013? Check whether the velocity is self cleansing or not. What would be the velocity and discharge when the same sewer is flowing 0.6 times of its full depth? Take; $\dfrac{v}{V}=1.646,\quad \dfrac{a}{A}=0.626,\quad \dfrac{q}{Q}=0.29$ 10

UNIT - II

3 a. With a neat sketch, explain the components and working operation of a manhole.   10

   b. A separate sewer from a town having a population of 60000 and supplied with 180 LPVCD of water enters a pumping station through a low level sewer at RL 120.00 m. This sewage has to be pumped to a high level sewer at RL 120.00 m. This sewage has to be pumped to a high level sewer at R L 129.00 m. Assuming that 80% of water reaches sewer,

Determine: 10

    i) Size of pump well

    ii) B.H.P. of pump motor required and

    iii) Size of the rising main, if the length is 120 m.

Assume suitable data wherever required.

4 a. Under what circumstances pumping of domestic wastewater becomes necessary? List the essential requirements of wastewater pump.   10

   b. Explain how do you determine :

     i) Size of sump well

     ii) Size of rising main   10

     iii) B.H.P. of pump motor

UNIT - III

5 a. Define BOD and COD. Deduce expression for first stage BOD.   10

   b. What are the limitations of BOD test?   5

   c. If 2.5 ml of raw sewage has been diluted to 250 ml and the DO concentration of the diluted and the beginning of BOD test was 8 mg/l and 5 mg/l after 5-day incubation at 20ºC, determine the BOD of raw sewage   5

6 a. With the aid of neat sketch indicate deoxygenation, reoxygenation and oxygen hag curve. List factors affecting self purification. Explain them in brief.   10

   b. In a tabular form, indicate the durability standards for wastewater effluents to be discharged on Land, for irrigation.   4

   c. What is meant by 'Sewage sickness'? Describe the preservative measures adopted to avoid the same.   6

UNIT - IV

7 a. Define: unit operation and unit process. With a flow diagram, indicate the different unit operations and unit processes used in a typical domestic wastewater treatment plant.   10

   b. Design a screen chamber for an average flow of 0.21 m^3/s and peak flow of 0.42 m^3/s. Assume bars to be inclined at 30º to horizontal and providing 25 mm x 5 mm size rectangular bars at 30 mm c/c.   10

8 a. In a tabular form, indicate the design parameters of Grit chamber.   4

   b. Describe the different methods adopted for disposal of screenings.   6

   c. With neat sketch, explain primary settling tank operation.   10

UNIT - V

9 a. With the aid of flow diagram, explain the essentials of activated sludge process.   10

   b. Write a neat diagram of sludge drying bed and name the salient features.   5

   c. What is meant by 'Recirculation'? State advantages of the same.   5

10 a. What is meant by digestion of sludge? Explain the factors affecting sludge digestion.   10

   b. With a neat sketch, explain the working of an anaerobic sludge digester.   10

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