[5]

MM: 60

NOTE: Attempt all questions in given sequence
Assume suitable data, if necessary

Q1. a. The present population of a community is 28000 with an average water demand of 150 lpcd. The existing water treatment plant has a design capacity of 6000 m^3/d. It is expected that the population will increase to 48000 during the next 20 years. What is the number of years from now when the plant will reach its design capacity assuming an arithmetic rate of population growth?

b. Two reservoirs at different levels are connected by two parallel pipes of diameter '2d' and 'd'. What is the ratio (larger: smaller) of the flows in the two pipes?

c. What is the depth of waterseal in traps?

d. Mention the condition that must be satisfied for a circular and rectangular sewer to be hydraulically equivalent?

e. The concentration of OH^- ion in a water sample is measured as 17 mg/l at 25^0C. What is the pH of the water sample?

f. Which of the following is the purpose of providing a surge tank in pipeline carrying water?
1. To increase pressure throughout the pipeline
2. To store overflowing water
3. To protect pipeline against water hammer

g. In transition of sewers from smaller diameter sewers to larger diameter sewers, the continuity of sewers is maintained at the
1. Bottom of concrete bed of sewers
2. Inverts of the sewers
3. Crowns of the sewer
4. Hydraulic gradients of the sewers

h. One sewer has a dia. of 300 mm and another has a dia. of 600 mm. When both run half-full, what will be the ratio of velocities in the two pipes if the slopes of both the pipes are same?

i. Why is an axial flow pump suitable for storm water pumping?

j. Mention the interval at which the following are provided along the pipeline:
1. Manhole   2. Sluice valve   [10]

Q2. a. Briefly explain the various types of storm regulators in combined sewerage.

b. A combined sewer of circular section is to be laid to serve an area of 100 ha with a population of 90000 supplied with water at 200 lpcd. Assuming an impermeability factor of 0.50 and time of concentration of rainfall 't' as 20 minutes, calculate the size of the sewer when it has to run full with a velocity of 0.3 m/s. Assume coefficients a=75 and b=10. Also, the maximum dry weather flow is thrice the average flow.   [5]

Q3. a. A reflux valve on 75 cm dia steel main, 3 km long, is closed in 1 minute when the rate of flow is 60 MLD. What extra pressure will get developed due to the closing of the valve, assuming E for steel as 2.1×10^6 kg/cm^2, and thickness of the pipe shell as 10 mm?   [5]

b. Differentiate between manhole, drop manhole, clean-out and lamphole based on their functional utility. Use neat sketches to explain.   [5]

Q4 a). Explain the function and types of traps in sanitary plumbing system with suitable examples. How the water seal in traps be broken and what methods are employed to maintain the seal?   5   [5]

b) A service water tank receives water from the treatment plant at the rate of 200 m³/h for 24 hours. The high lift pumps lift water from the same tank at following rates: 4-14 hours at the rate of 120 m³/h and 15-24 hours at the rate of 400 m³/h. Determine the capacity of the service water tank.   [5]

Q5 a) With the help of a neat sketch explain the functioning and requirement of various components in a typical service connection from water mains.   5   [5]

b) A 15 cm dia borehole well was drilled to supply 360 l/min of water. The water level in the well was 18 m below GL. Water is to be conveyed to a place 50 m away from the well. If the drawdown is 20 m and water is lifted 2 m above GL, determine the power in kW of the motor of the pump, given the overall efficiency as 65%. Friction including strainer and other losses may be taken as 5% per meter length of delivery pipe.   [5]

Q6 a) Explain the phenomenon of crown corrosion. Why are sewer pipes laid starting from their outfall end towards their starting end?   97 to 98 BC Plummir   5   [5]

b). A 60 cm dia sewer is required to flow at 0.4 depth on a grade ensuring a degree of self-cleaning equivalent to that obtained at full depth at a velocity of 85 cm/s. Find the required grade, velocity and discharge at full depth and 0.4 depth. Assume N=0.015 at full depth and N/n = 0.79 at 0.4 depth.   [5]

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