

GUJARAT TECHNOLOGICAL UNIVERSITY**ME - SEMESTER- I • EXAMINATION – WINTER 2014****Subject Code: 2711701****Date: 06/01/ 2015****Subject Name: Application Based Systems for Transport of Water & Wastewater****Time: 02:30 p.m. to 05:00 p.m.****Total Marks: 70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

- Q.1** (a) When a sudden contraction is introduced in a horizontal pipeline from 500 mm diameter to 250 mm diameter, the pressure changes from 105 kN/m² to 69 kN/m². If the co-efficient of contraction is assumed to be 0.65, calculate the water flow rate. Following this if there is sudden enlargement from 250 mm to 500 mm and if the pressure at the 250 mm section is 69 kN/m², what is the pressure at the 500 mm enlarged portion? **07**
- (b) Define continuity principle, energy principle and momentum principle. **07**
- Q.2** (a) Discuss specifications for laying and jointing of pipes. **07**
- (b) Define Water hammer and explain its causes. **07**
- OR**
- (b) Write short note on centrifugal pumps with its merits and demerits. **07**
- Q.3** (a) The population of a town is 2.5 lakh and its per capita demand is 270 litres/day/capita. The probable hourly variations in the demand rate are given below in Table. Determine the capacity of the storage reservoir to be provided for balancing the variable demand against a constant rate of pumping (a) if the pumping is to be done only from 5 a.m. to 11 a.m. and 2 p.m. to 8 p.m. (b) if the pumping is to be done for all the 24 hours. Also determine the rate of pumping in each case. Solve problem using analytical method. **07**

Period of day in hours	% of average hourly flow expected	Period of day in hours	% of average hourly flow expected
0-1	15	12-13	100
1-2	16	13-14	90
2-3	17	14-15	60
3-4	20	15-16	110
4-5	25	16-17	130
5-6	35	17-18	160
6-7	75	18-19	180
7-8	130	19-20	170
8-9	180	20-21	140
9-10	230	21-22	70
10-11	220	22-23	50
11-12	160	23-24	17

- (b) What is ESR? Explain types of ESR in details. **07**
- OR**
- Q.3** (a) Explain Grid ñ Iron system with its advantages and disadvantages. **07**
- (b) Describe components of water distribution systems. **07**
- Q.4** (a) Write a short note on flushing tanks with sketch. **07**
- (b) Design sedimentation for a water works, which supplies 1.4×10^6 litre/day **07**

water to the town. The sedimentation period is 5 hours, the velocity of flow is 10 cm/minute, depth of water in the tank is 3.0 m. Assuming an allowance for sludge is to be made as 80 cm.

OR

- Q.4 (a)** Enlist types of intakes and explain any one in detail. **07**
(b) Determine the projected population by Arithmetic increase method for a town from the available census data. Assume the design period of 30 years. Consider the year of last census data as the base year. Available census data for the last 5 decades are given below. **07**

Census data		
Year	Population (P)	Density (P/km ²)
1971	3,50,000	3500
1981	3,85,000	3850
1991	4,30,000	4300
2001	4,90,000	4900
2011	5,80,000	5800

Assume the following basic design criteria :

Design period = 30 years

Base year = 2011

Phase I year = 2026

Phase II year = 2041

- Q.5 (a)** Write short note on rainfall intensity curves. **07**
(b) How quantity of storm sewage is determined by Rational Method? Discuss in detail. **07**

OR

- Q.5 (a)** The catchment area of a city is 200 hectares. Assuming that the surface on which the rain falls is classified as follows : **07**

Types of surface	% Area	Runoff coefficient
Roofs	20	0.9
Pavement and yards	15	0.7
Lawns, gardens	35	0.25
Macadamized roads	25	0.4
Vacant plots	18	0.1

Calculate the impervious factor. If the maximum intensity of rainfall is 30 mm/hour, calculate the quantity of storm water which will reach sewer lines. If the density of population is 300 persons/hectare and the rate of water supply is 270 litres/capita/day, calculate the quantity of sanitary sewage for (a) separate system and (b) for partially separate system.

- (b)** Write down the sources of sanitary sewage and explain factors affecting sanitary sewage. **07**
