

Indian Institute of Technology, Kharagpur

End-Spring Semester Examination
Session 2011-2012
Subject No. AR22004
Subject name: Water Supply and Sanitation

Second Year B.Arch.
Time: 3 hours
Full Marks: 100
April, 2012

Question 1:

A real estate project contains:

- High-rise apartment buildings housing a residential population of 30,000 which has to be supplied with water at the rate of 200 liters per head per day and
- Shopping mall with a footfall of 30000 customers per day and 1000 staff. (Estimate the value for water requirement per day for the shopping mall)
- Water is supplied from a clear water reservoir **800** meters away from the overhead reservoir. The difference in elevation between the lowest water level in the clear water reservoir and the elevated reservoir is **36** meters.

The variation in residential water demand is as follows:

6 am to 9 am -----	30% of total
9 am to 12 noon -----	15% of total
12 noon to 3 pm -----	5% of total
3 pm to 6 pm -----	10% of total
6 pm to 9 pm -----	30% of total
9 pm to 6 am -----	10% of total

The water demand in the shopping mall is uniform and spread over the period 12 noon to 9 pm. The period of pumping/supply is from 7 am to 9 am and 3 pm to 6 pm.

- Determine the size of the main and the B.H.P. of the pumps required. Assume $f = .0075$, velocity of water in the pipe = **2.4** meters/second and efficiency of pump = **70 %**.
- Determine the capacity of the common overhead reservoir for the entire project. Neglect fire demand and breakdown storage. Solve by the mass curve method.

20

Question 2:

Write short notes on:

- Typical water connection between the building service pipe and the municipal water main
- Different types of joints in water supply pipe lines.
- Centralized hot water system

(7+6+7)=20

Question 2:

Explain in detail the steps involved in designing the water supply network in a multi-storied residential building with 8 floors and 4 apartments in each storey. Each apartment has two toilets, one kitchen and one separate wash basin. Prepare a rough floor plan of the building, assign fixtures and estimate the length of water supply pipeline to the different fixtures. The water is supplied from a single overhead tank. Make all other necessary assumptions. (Assume values for probable simultaneous demand as well)

30

Question 4:

Write short notes on

- a) Water closets & siphonic wash down action in water closets
- b) Conservancy toilets
- c) Soak pits and dispersion trenches

(10+10+10)=30