

**BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(MID SEMESTER EXAMINATION)**

**CLASS: BE
BRANCH: CIVIL**

**SEMESTER: VI
SESSION : SP/2019**

SUBJECT : CE6001 ENVIRONMENTAL ENGINEERING

TIME: 1.5 HOURS

FULL MARKS: 25

INSTRUCTIONS:

1. The total marks of the questions are 30.
2. Candidates may attempt for all 30 marks.
3. In those cases where the marks obtained exceed 25 marks, the excess will be ignored.
4. Before attempting the question paper, be sure that you have got the correct question paper.
5. The missing data, if any, may be assumed suitably.

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- Q1 (a) Define design period in water supply scheme? Identify the factors which influences the selection of design period. [2]
(b) The population data of a town from 1950 to 1990 are given below. Estimate the population of this town after, one, two and three decades with incremental increase method. [3]

Year	1950	1960	1970	1980	1990
Population	40,000	44,800	54,400	67,200	75,000

- Q2 (a) What is zoning method and apportionment method for forecasting of population? [2]
(b) Design water supply scheme for a city with 2.0 million people. Estimate the important drafts when water is to be supplied at 220 lpcd. Also, find out the capacities of various components in the water supply scheme. [3]
- Q3 (a) Summarize the factors that are considered in locating an intake structure. [2]
(b) The velocity of water flowing from a reservoir into 1.2 m diameter steel pipe is 2 m/sec. Determine the water hammer pressure developed upon closure of a valve situated in the pipe line at 1.8 km from the reservoir, if the closure time is 4 sec and 8 sec. Given data: thickness of pipe shell = 0.03 m, velocity of pressure wave = 1450 m/sec, modulus of elasticity of water = 21×10^5 kN/m², modulus of elasticity of steel pipe = 21×10^7 kN/m². [3]
- Q4 (a) Determine the cost of power requirement for pumping water at 5 MLD where a centrifugal pump lifts water at a head of 40 m from intake well to discharge end. The efficiency of pump is 60% and efficiency of motor is 70%. The lift is for 0.5 km length of 4 inch diameter pipe and pump is operated at 1200 lpm. (Given data: $4f = 0.025$, power cost - Rs. 4.0/kWh.) [2]
(b) Draw a neat sketch and describe the components of a twin well type intake structure to withdraw water from river. [3]
- Q5 (a) Explain the common operational problems with rapid sand filters? [2]
(b) What flow velocity will be selected for removal of 0.02 mm particles at 25°C, in a continuous flow settling tank which is 4 m deep and 60 m long. (Sp. Gravity of particle - 2.7, kinematic viscosity 0.01 cm²/sec) [3]
- Q6 (a) Describe the important parameters used in determining water quality. [2]
(b) A rapid sand filter with filtration rate of 15 m³/m²/hr is to be installed in a water treatment plant for a city with population of half million. 5% filtered water will be used for backwash operations and backwashing period is of 30 min. Available surface area configuration of filter unit is 10 m x 4 m. Find out the number of filters required where one unit will be standby. Also, find out the upflow velocity and headloss to expand the bed to 0.7 m from original undisturbed bed depth of 0.6 m. (Given data: Bed porosity 0.6, sp. Gravity 2.6, average particle size 0.6 mm, drag coefficient 5.0, assume transitional). [3]