**WASTEWATER ENGINEERING**

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**Submitted by**

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**Question 1.**

**What is Wastewater Engineering? Briefly describe its applications in safeguarding the environment?**

Answer

**Wastewater Engineering**

Wastewater Engineering or Sanitary engineering, also known as public health engineering, “is the application of engineering methods to improve sanitation of human communities, primarily by providing the removal and disposal of human waste, treatment and reuse application for various purposes.”

**Applications of Wastewater Engineering in safeguarding the Environment:**

Wastewater Engineering is directly related to improving environment i.e.

1. In order to reduce groundwater contamination and protect aquatic life by disposing off treated wastewater.
2. Wastewater engineering deals with the management of waste water and its treatment to reuse it for various purposes
3. Primary objective of wastewater engineering is to provide a good sanitary environmental condition in a city
4. Wastewater engineering is important for our environment because available water per capita is decreasing day by day. As the wastewater is 99.9% clean but only contain 0.1% of contamination If we treat the wastewater to remove 0.1% of contamination by using techniques of wastewater engineering and reuse for several purposes (i.e. car washing)In this way we may overcome the problem of decreasing available water per capita.
5. By treating wastewater we may protect our groundwater from contamination and also if we treat wastewater and reuse for different purposes so our groundwater will be used minimum and will be safe for our future.
6. Highly contaminated industrial wastewater discharged directly into the environment evaporates and returns back to the environment through hydrological cycle in form of acid rain and smell of toxic substances damages respiratory system of humans. If we strictly treat industrial wastewater than environmental will be safeguarded from hazardous.
7. Contaminated wastewater interacts with plants that decays and some type of plants are used by humans as a result disruption of ecosystem takes place and endangers the environment in order to protect the environment the wastewater must be treated before discharging into environment.

**Question 2**

**Briefly describe the relationship of wastewater generation with water supply of a locality?**

Answer

Wastewater generated is dependent on supplied water and population of the locality as the population increases wastewater generated will be more.

About 60 to 85% of supplied water per capita becomes wastewater.

In situations where wastewater flows rate data are limited or unavailable so in such condition wastewater flow rates estimates for the design of sewerage system are developed from water consumption records and other information.

If there is an industrial zone in a locality than water supply to that region will be more and hence wastewater generated will be more.

**Question 3.**

**What is the importance of wastewater characterization?**

Answer

**IMPORTANCE OF CHARACTERIZATION OF WASTEWATER**

Characterization of wastewater helps us in identifying the quality of wastewater i.e. characterization of wastewater helps us in determining the type of contamination in wastewater and then we design wastewater treatment plant according to the type of contamination.

**Example**

Chemical Contamination

If the wastewater is generated from sources like urban runoff,mining,landfills,leakage,pesticides, radioactive waste and animal waste fertilizers, for wastewater generated from these sources we will design treatment plant with main focus to remove chemical contamination.

Physical Contamination

Also if the wastewater contamination is physical like sewage including toilet paper etc. than we will design treatment plants accordingly.

Biological Contamination

If the wastewater contains pathogens etc. then our treatment plant main focus will be on removal of biological contamination.

**Question 4**

**Enlist physical, chemical and biological characteristics of wastewater?**

Answer

**Physical Characteristics**

* Solids

(Settleable solids, Total solids (TS), Total suspended solids (TSS),

Total Dissolved Solids (TDS), Volatile and Fixed Solids (VS and FS) )

* Odor
* Temperature
* Density and Specific Gravity
* Turbidity
* Color

**Chemical Characteristics**

* pH Value
* Organic Matter (OM)
* Nitrogen Contents
* Chlorides Contents
* Fats, Oils and Greases
* Sulphides, Sulphates and Hydrogen gas
* Toxics
* Dissolved Oxygen (DO)

**Biological Characteristics**

* Biological oxygen demand(BOD)
* Oxygen required for nitrification
* Microbial Population(Bacteria, Pathogens)

**Question 5**

**What are the advantages and disadvantages of combine and separate sewerage system?**

Answer

**Combined Sewerage System**

***Advantages***

1. Both domestic sewage and storm water are carried in a single sewer, so construction cost is less.
2. The strength of domestic sewage is reduced because of dilution of storm water.
3. The sewers are of large size, and therefore the chances of their chocking are rare. It is easy to clean them.
4. In towns with narrow streets, this system is preferred.

***Disadvantages***

1. Initial cost is high because of large dimensions of sewers.
2. Because of large size of sewer, their handling and transportation is difficult.
3. Due to the inclusion of storm water, the load on the treatment plant increases and ultimately increases treatment costs
4. During heavy rain the sewer may be overflow and may thus create unhygienic conditions.
5. If the whole sewage is to be disposed off by pumping it is uneconomical.

**Separate Sewerage System**

***Advantages***

1. Size of sewers is generally less.
2. Since the sanitary sewage and storm water flows in a separate pipes, the quantity of sewage to be treated is less.
3. As the sewers are smaller in section, they can be easily ventilated.
4. Rain water can be discharged in to the streams or can be reused / recycled without any treatment.

***Disadvantages***

1. Since the sewers are of smaller size, it is difficult to clean them.
2. They are likely to get chocked / blocked.
3. Initial cost is high, when two separate sets are used.
4. Maintenance cost of system is also high.

**Which sewerage system will you recommend for a new proposed township Support your answer with justification?**

I suggest separate sewerage system because

**Reason**

* The rain water which is not that much contaminated will be collected or treated separately and needs little or no treatment.
* Also in case of more rain the rain water will be collected separately so no danger for pipes to burst out.
* And also the rain water will be protected from being contaminated with domestic sewage while the domestic sewage is highly contaminated and require strong treatment