IQRANATIONAL UNIVERSITY,PESHAWAR

DEPARTMENTOFCIVIL ENGINEERING,

FINALTERMEXAMINATION

SUBJECT:WATERSUPPLY ANDWASTEWATER MANAGEMENT

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Q1 (i) Define wastewater. Briefly describe types?

Ans = Wastewater:

Wastewater is any water that has been contaminated by human use. wastewater is used water from any combination of domestic, industrial commercial or agricultural activities.

(Types of wastewater:

Greywater: washing water from the kitchen, Bathroom, laundry (without faeces and urine)

Black water: water from flush toilet (faeces and urine with flush water)

Yellow water: urine from Separated toilets and Urines

Brown water: Black water without urine or Yellow water.

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1) What are characteristics of wastewater?

Characteristics of wastewater.

Wastewater can be checked and analysed BY Studing and testing their physical. chemical and microscopic characteristic

physical:
Color, Taste and odours, temperature, Turbidity,

Chemical:
total Solids and SS, pH value, Hardness of water, Chloride Content, Nitrogen Content,

Microscopical:
The Purpose of a microscopic evaluation is to determine the Biological health of a wastewater treatment system. The Results can be used to help Predict Biochemical oxygen Demand Chemical oxygen demand, ToC, and TSS Result.

Q No 02 (A) Why treatment of wastewater is necessary Briefly describe wastewater treatment purpose

Ans =

& wastewater treatment:
usually refer to Sewage treatment or Domestic wastewater treatment process of removing contaminations from wastewater, both Runff and Domestic

purpose wastewater Trat-

Collected and transported via a network of pipes and pump Stations to Municipal treatment plant.
To produce waste stream
To produce Solid waste, to discharge or reuse them back into the environment.

Treatment, wastewater

=> Primary: Solid are Separated,
=> Secondary: dissolved Biological matter is converted into solid mass by using water both Bacteria
=> Tertiary & Biological Solid are neutralized then dissolved and treated water

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DNo 02 (B) Elaborate why we use need a measure of wastewater flow:

Ans Determin the Rates of wastewater flow is a fundamental step in the design of wastewater collection, treatment and disposal facilities. In Situation where wastewater flow rate data are limited or unavailable have to be developed from water consumption records and other information.

The traditional method of measuring wastewater flows is through the use of a flum and an ultrasonic flow meter in a flow manhole the combination is reliable and usually require low maintance.

To develop a basis for properly assessing wastewater flow rates for a community the following.

wastewater Sources and flow rates
Analysis of flow rates data, and
Method of Reducing wastewater flow
Rates water supply data and its Relat

Q No 05 :- Briefly describe preliminary wastewater treatments:-

Ans The objective of Preliminary treatment is the removal of coarse Solids and other large materials often found in Raw wastewater Preliminary treatment operation typically includes Coarse Screening. grit removal and in Some cases Comminution of large objects. In grit Chamber the velocity of water through the Chamber is maintained sufficiently high. Communicatin are Sometimes adopted to Supplement Coarse Screening and Serve to reduce the size of large particle So that they will be removed in the form of a Sludge in Subsequent treatment process.

Preliminary : Grit Chamber

Aerated grit Chamber : Diffused air keep organic Solids in Suspension as grite Settles : Vortex is created Grit move to the bottom of the unit and gets collected.

P.T.O

Preliminary : Comminutor:
In this device all of the flow passe through the grinder assembly. The grinder consists of a screen or slotted Basket, a rotating or oscillating cutter
Solids pass through the screen and are chopped shredded b/w the two cutter.

Q No 05 What is meant By primary (B) treatment of wastwater? Describe sedimentation tank and Clarifier

Ans= The objective of primary treatment is the removal of Settle-able organic and inorganic Solid By Sedimentation and the removal of materials that will float By Skimming.
Approximately 25 to 50% of the incoming BioChemical oxygen demand 50+70% Some organic nitrogen, organic phosphorus and heavy metals associated with Solids.

P.T.O

Primary Sedimentation tank or clarifiers may be round or Rectangular Basins, typically 3 to 5 m deep with hydraulic retention time between 2 and 3 hours.

Settled Solids are normally removed from the bottom of tank by sludge rakes that scrape the sludge to a central well from which it is pumped to sludge processing units.

Sedimentation Tanks & clarifie

Typically Sedimentation tanks:

a) Rectangular horizontal flow tanks.

B) Circular Radius. flow tanks.

c) Hopper-Bottomed, upward flow Tanks.

In Large Sewage treatment plants (> 7600 m³/d) primary sludge is most commonly processed Biologically in the digestion process, anaerobic and facultative bacteria metabolize. Gas containing about 60 to 65% methane is produced during digestion.

Q.No 03 (a) Determin 1-day BOD and ultimate BOD for wastewater whose 5-day 20°C BOD 180gm/L. Reaction Constant $K = 0.24^{-1}$ what would been 5-day BOD if 25°C

Sol=

Sol=

$$BOD_t = L_0\left(1 - e^{-Kt}\right)$$

By putting value.

$$180 = L_0\left(1 - e^{-0.24\times5}\right)$$

$$L_0 = \frac{180}{\left(1 - e^{-0.24\times5}\right)} = 257.58 \text{ mg/L}$$

(UBOD)

Now we determin the 1-day BOD

$$BOD_t = L_0\left(1 - e^{-kt}\right)$$

$$BOD_t = 257.58\left(1 - e^{-0.24\times1}\right)$$

$$= 54.96 \text{ mg/L}$$

Now we determin 5-day BOD at 25°C

$$K_t = K_{20}\left(1.047\right)^{T-20}$$

for $T = 25$

P.T.O

$$K_{25} = K_{20}(1.047)^{25-20}$$

$$K_{25} = 0.24(1.047)^{5}$$

$$K_{25} = 0.302$$

$$BOD_5 = L_0(1-e^{-kt})$$

$$= 257.58(1-e^{-0.302\times5})$$

$$BOD_5 = 200.68 mg/L$$

03 ∴ Differentiate b/w biological oxygen demand and Chemical oxygen demand.

Biological oxygen demand:

~~BOD~~ Both chemical and Biologically test methods aim to give an indication of the amount of pollution in water sample. COD is the amount of oxygen required to chemically breakdown the pollutants whereas BOD is the amount of oxygen BOD is the amount of oxygen required to do this Biologically through micro organisms. There are a Strong correlation b/w Chemical and Biologicall demand however COD analysis is a much faster and more accurate method. BOD analysis is performed to determine what effect dirty water, containing bacteria and organic materials will have an animal and plants life when released into a stream or lake.

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Q.No. 04 (A) A city has projected population of 55000, spread over area of 52 hectar. Find the design discharge for the separate sewer line assuming water supply 248 LPCD and total supply only 75%

Sol=

Given data:

Q = 248 Lit/cap/day

Sewage flow = 75% of water supply

0.75×248

$= 186$ LPCD

total Sewage generated $= 186 \times 5500 / 24 \times 3600$

Assume peak factor = 1.14 Lit/sec

total design discharge = $0.14 m^3/s$

Assume peak factor = 2

total design discharge

$0.28 m^3/s$.

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Q4 (B) Why Biological Characteristic is an important factor in wastewater treatment.

Ans The environmental engineer must have Considerable knowledge of the Biological of wastewater because it is a very important characteristics factor in wastew
The principal groups of microorganism found in wastewater.
The pathogenic organism,
Indicator organism presence of pathogens.
The method used to amount the microorganism
The method to evalute the toxicity of treated wastewater
Nitrosomonas: transform NH_4 into NO_2
Nitrobacter: transform NO_2 to NO_3
Fungi: Important in decomposing organic matter to simple forms
Algae: Cause eutrophication phenomena (-)
useful in oxidation Ponds: (+)