BHARTIYA INSTITUTE OF ENGINEERING & TECHNOLOGY, SIKAR

DEPARTMENT OF CIVIL

ENVIRONMENTAL ENGINEERING -II (6CE3A)

M.M. → 20

Q.1 (A):→ Define following terms (5)

(A) BOD (B) COD

(a) BOD:→ Bio-chemical oxygen demand:-

The amount of O_2 required to carryout the decomposition of bio-degradable organic matter present in the system is termed as bio-chemical oxygen demand. BOD during 5 days at 20°c is taken as standard BOD and it is approximately 68% of ultimate BOD.

(b) COD:→ chemical oxygen demand:→

The BOD test takes a minimum of 5days time, and due to this it is not useful in the control of treatment processes. So An Alternative test is the COD test. Which can be used to measure content of organic matter of waste.

COD can be determine only in 3 hours. In this test, a strong chemical oxidising agent used in acidic medium to measure oxygen equivalent to organic matter that can be oxidised. chemical oxidising agent is $K_2Cr_2O_7$.

Q. 1(B):→ Determine ultimate BOD for a sewage having 5 day BOD at 20°C as 160 mg/L Assume the deoxygenation constant as 0.2 per da (5)

Sol.:→ given $BOD_5 = 160 mg/L$

$K_D = 0.2$ per day

$$BOD_5 = L_o - L_5$$

$$\Rightarrow L_o(1 - 10^{-5K})$$

$$160 = L_o(1 - 10^{-5 \times 0.12})$$

$$160 = L_o(0.7488)$$

$$L_o = 213.7 mg/L$$

Q. 2 (A) Compare the conservancy and water carriage systems of sewerage. (5)

S.No.	Conservancy system	Water carriage system
1	The system is unhygienic	The system is hygienic.
2.	Due to putrefication, there is a lot of foul smell.	No chances of putrefication, hence no foul smell.
3.	Large labour force is required.	labour force is small
4.	Water consumption is small.	require high water consumption.
5.	No technical persons required	technical persons required.
6.	Acute pollution problems.	pollution problems are rare
7.	Risk of spread of epidemic	No such risk
8.	Initial cost is small, though the running costs are high	High initial cost. Runnig cost small.
9.	Good quality manure available from the end products.	The sludge has small manure value.
10.	The system is more suitable for rural conditions	The system is better suited for urban conditions.

Q.2 (B):→ Calculate the velocity of flow, and discharge in a sewer of circular section having dia of 1m, laid at a gradient of 1 in 500. Use manning formula N=0.012 Assume that the sewer is running half full. (5)

Given :→ $i = \frac{1}{500}$

$N = 0.012$

$D = 1m$

Velocity $(V) = \frac{1}{N} (m)^{2/3} (i)^{1/2}$

$(a) = \frac{\pi}{8} D^2$

$P = \frac{\pi D}{2}$

$M = \frac{a}{P} = \frac{D}{4} = \frac{1}{4} = 0.25m$

$V = \frac{1}{0.012} \times (0.25)^{2/3} \left(\frac{1}{500}\right)^{1/2}$

$= 1.479 \text{ m/s}$

$Q = AXV$

$= \frac{\pi}{8}(1)^2 \times 1.479$

$= 0.581 \text{ Cumecs}$