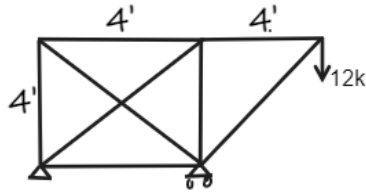
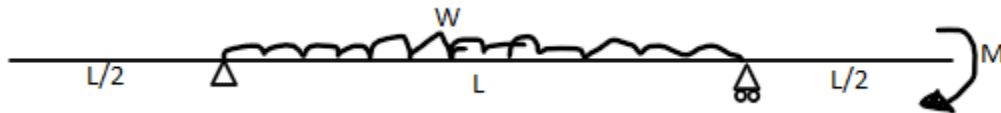


RUET MSc-2023

1. Shear stress and normal stress are given of two samples. Find the value of cohesion and angle of internal friction.
2. Solve the following truss.



3. Draw qualitative SFD and BMD.



4. Stress-strain diagram of mild steel, toughness and, modulus of resilience definition
5. Short note CBR, importance of CBR on pavement design
6. 80/100 grade bitumen, what do you mean by flow value 20 and the significance of these.
7. Velocity distribution profile of Various channel
8. Difference between relative density and relative compaction
9. An activated sludge plant with MLVSS as 2000 mg/l treats with an ultimate BOD of 900 mg/l and 300 mg/l VSS which are 86% biodegradable. If the plant effluent contains 20 mg/l ultimate BOD and 15 mg/l VSS, determine the daily VSS accumulation and the oxygen requirement for a flow of 0.40 m³/s. take synthesis constant p as 0.55 and the endogenous respiration constant q as 0.15.

Solution:

$$V_i = 300 \text{ mg/l}$$

$$V = 2000 \text{ mg/l}$$

$$X_r = (900 - 20) = 880 \text{ mg/l}$$

$$r = (100 - 86) = 14\% = 0.14$$

$$p = 0.55 \text{ and } q = 0.15$$

The expression for VSS accumulation is

$$V_a = (rV_i + pX_r) - qV = (0.14 \times 300 + 0.55 \times 880) - 0.15 \times 2000 = 226 \text{ mg/l}$$

As effluent contains 15 mg/l VSS, the net accumulated mass of VSS is

$$(226 - 15) = 211 \text{ mg/l}$$

$$V_a = (211 \times 0.4 \times 1000) \text{ mg/sec} = 7292 \text{ kg/day}$$

For oxygen requirement, the expression is

$$O_2 = 0.39X_r + 1.42qV = (0.39 \times 880) + (1.42 \times 0.15 \times 2000) = 7692 \text{ mg/l}$$

$$O_2 \text{ in kg/day} = (7692 \times 10^{-3} \times 0.4 \times 24 \times 3600) = 26584 \text{ kg/day}$$