

BSTI-2023

$$MCQ + CA = 60 + 40 = 100$$

Time: 1.5 hours / BUET

$$MCQ - 60 \times 1 = 60$$

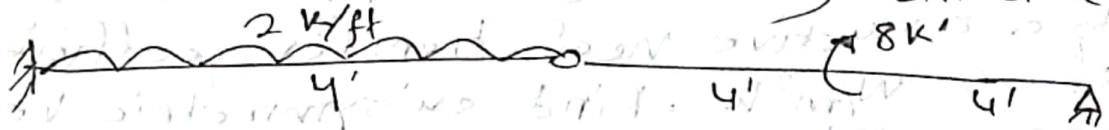
$$MCQ - 10 \times 4 = 40$$

1. Define FM of aggregate. Find the FM of the sand for the following sieve analysis.

Sieve No.	Wt Retained (g)
4	0
8	0
15	2.1
30	15.8
40	31.7
50	37
75	10.5
100	05.6
Pan	0.3

2. BOD₅ of the wastewater is 200 mg/L. If the rate constant 0.18 per day at 20°C, find BOD₁₀ of the same temperature (e base).

3. Draw SFD & BMD of the following structure.



4. What are steel and cast iron. List the basic properties and their applications.
5. Calculate the best hydraulic rectangular cross section to convey the discharge of 10 m³/s if the coefficient of Manning's roughness 0.02 and

bed slope 0.0009.

6. A steel ($E = 200 \text{ GPa}$ and Poisson's ratio 0.3) of cross section $10 \text{ mm} \times 10 \text{ mm}$ and length 2 m . If it is applied a tensile force P and the maximum ~~flexural~~ tensile stress 200 MPa .
- find P , and the energy absorbed the
 - Maximum ~~flexural~~ shear stress of the steel.
7. A horizontal aluminium wire (Poisson's ratio 0.28) and diameter 4.8 cm ; projected 9.7 cm from a wall. If 1200 kg load is suspended from its free end, find average ~~shear~~ tensile stress and deflection at free end.
8. In an industry many pipes are used to carry hot water. Internal surface of a typical pipe (outer dia 100 mm , thickness 9 mm) is at a temperature of 70°C and the outer external surface at 25°C . The external surface of the pipe is subjected to a convective heat transfer coefficient of $6 \text{ W/m}^2 \text{K}$. Find axisymmetric heat loss and resistance per unit length. The pipe's thermal conductivity is 50 W/mK .
9. Which group of materials (viz. metallic, ceramic, polymeric and composite) do glasses belong to? Justify your answer.

List down the raw materials used in the manufacturing of window glass and indicate which one of these raw materials is used in the highest proportion.

10. What is Carnot cycle? An ideal gas engine works in a Carnot cycle between 227°C and 127°C . The engine receives heat at a higher temperature. What is the efficiency and how much work does it perform in Joule.