① Determine the FM of fine aggregate and Co-Efficient of Uniformity ~~Co-efficient of curvature~~ and percentages of silt and clay.

Sieve Size	#4	#8	#16	#30	#40	#50	#100	#200	Pan
% retained	0	1	4	12	23	40	10	6	4
% cumulative retained	0	1	5	17	40	80	90	96	100
% finer	100	99	95	78	60	20	10	4	0

$$F.M = \frac{1+5+17+80+90}{100} = 1.93$$

#40 = 0.425 mm
#100 = 0.15 mm

% of silt and clay = (100 − 96) = 4%

$$\text{Co-efficient of Uniformity} = \frac{D_{60}}{D_{10}} = \frac{\#40}{\#100} = \frac{0.425}{0.15} = 2.83$$

② Given, water temp = 24.5° water density at 24.5° is 62.2 lb/ft³, Weight of water to fill the bucket = 9.33 lb. Weight of fine agg. to fill the ~~bag~~ bucket = 14.8 lb. Absorption of the aggregate is 2.65%. Bulk sp. gravity (OD) is 2.72. find unit weight of dry and SSD unit weight.

→

$$\text{absorption} = \frac{B-A}{A} \times 100\%$$

$$\Rightarrow 2.65 = \frac{B-14.8}{14.8} \times 100$$

$$\Rightarrow B = 15.1922 \text{ lb}$$

$$\therefore \gamma_d = \frac{14.8}{0.15} = 98.67 \text{ lb/ft}^3$$

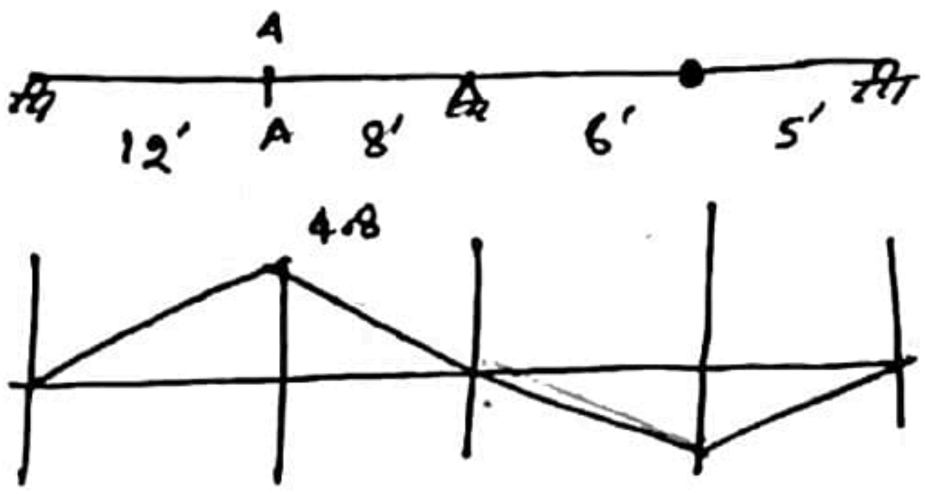
$$\gamma_{SSD} = \frac{15.922}{0.15} = 106.146 \text{ lb/ft}^3$$

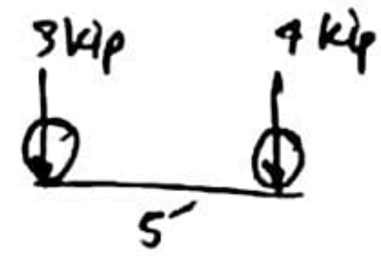
$$\text{Volume} = \frac{9.33}{62.2} = 0.15 \text{ ft}^3$$

A = 14.8 lb

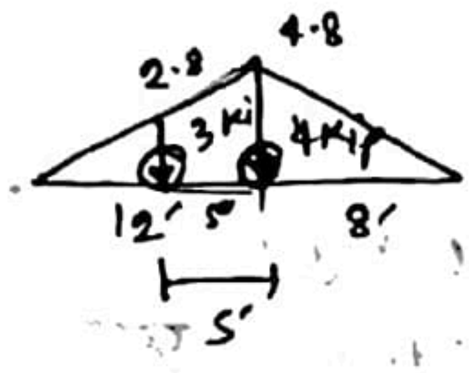
B = SSD weight of agg

④





Determine maximum positive moment, at A-A section.



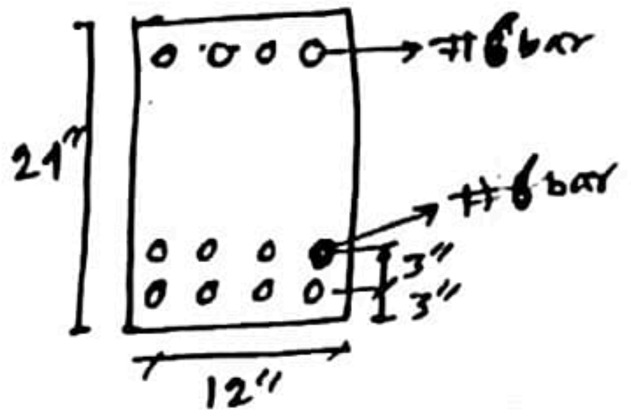
$$M_{A-A} = \frac{12 \times 8}{20}$$

$$= 9.8$$

$$\therefore M_{max} = (1 \times 9.8) + (2.8 \times 3)$$

$$= 27.6 \text{ k-ft.}$$

⑤ check the beam is either Singly Reinforced or Doubly reinforced Beam. then find maxi Ultimate moment Capacity.



→

$A_s' = 4 \times 0.44 = 1.76 \text{ in}^2$

$f'_c = 4 \text{ ksi}$

$A_s = 8 \times 0.44 = 3.52 \text{ in}^2$

$f_y = 60 \text{ ksi}$

$\rho = \frac{A_s}{bd} = \frac{3.52}{12 \times 19.5} = 0.01504$

$d = 24 - (3 + 1.5)$

$= 19.5''$

$\rho_b = 0.85 \beta_1 \frac{f'_c}{f_y} \times \frac{0.003}{0.003 + 0.002}$

$= 0.85 \times 0.85 \times \frac{4}{60} \times \frac{.003}{.005} = 0.0289$

$\rho_{max} = \rho_b \times 0.75 = 0.02177 \; 0.015$

∴ This beam is Singly Reinforced Beam

$a = \frac{A_s f_y}{0.85 f'_c b} = \frac{3.52 \times 60}{0.85 \times 4 \times 12}$

$= 5.17 \text{ inch}$

$\therefore M_u = \phi A_s f_y \left(d - \frac{a}{2}\right)$

$= 0.9 \times 3.52 \times 60 \times \left(19.5 - \frac{5.17}{2}\right)$

$= 3215.20 \text{ kip-in}$

$= 267.93 \text{ kip-ft}$

BAPEX 2023 (BUET)

(1) FM calculation, % of silt & clay and coefficient of curvature from sieve analysis.

(2) Simply supported beam Design.
$l = 16'$, f_c', f_y, dead & live load given. Find the concrete section & steel area.

(3) 10 mL wastewater is mixed with 990 mL water to dilute. Initial DO & DO at 5 days are given: At $t = 20^\circ C$, values of k_1 (ebase) is given also. Calculate the ultimate BOD.

④ To find out the dry density of fine aggregates in laboratory

→ unit weight of water, γ_w

→ mass of water filled in experimental jar

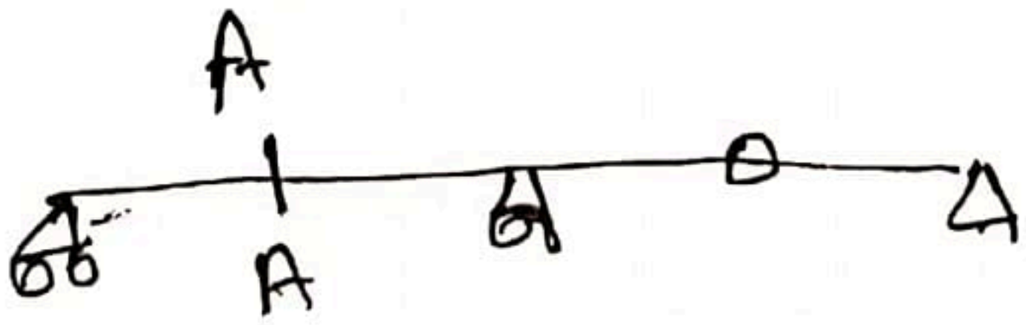
→ mass of fine aggregates in the same jar filled with

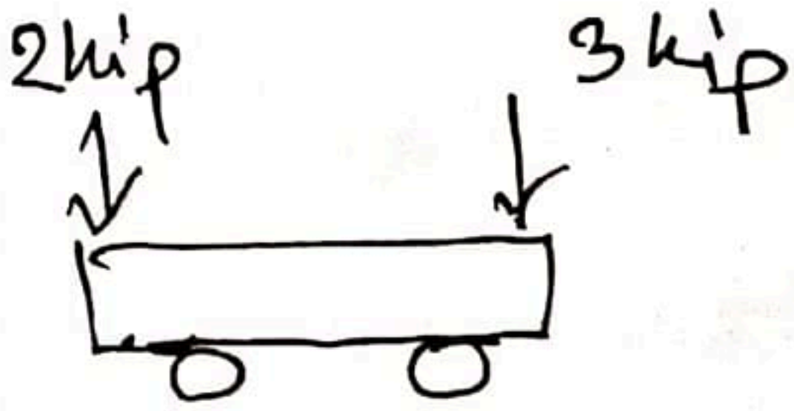
→ Bulk specific gravity of FA (oven d

→

→ Calculate the dry unit wt & SSD unit wt of Fine Aggregate.

⑤





IL at A for moment.

Also draw max^m positive moment diagram for the moving carriage section A-A.