



Important
remarks

- Assume any data not given
- No. of pages:2- No. of questions: 4

Marks: max. 100

Question No. (1):

- Explain briefly the different main tests (الإختبارات الأساسية) should be carried out on the **Portland Cement** to study its applicability to the Standard Specification, and then Explain one of these tests?
- Explain in sketches, the effect of Sand/Gravel ratio (S/G) on the properties of concrete in both (1) fresh stage, and (2) hardened stage?
- Discuss briefly, what is meant of compactability of fresh of concrete and how to determine it experimentally?

Question No. (2):

It is required to:

- Design a concrete mix. to give a mean concrete strength of 300 kg/cm².
- Calculate the expected degree of workability (based on the compacting factor)?

given data:-

- The required slump is 100 mm (W = 175 Litres).

- The mix. ratio between sand and gravel (S : G = 1 : 1.85).

$\gamma_s = \gamma_g = 2.7$, $\bar{\gamma}_s = \bar{\gamma}_g = 1.66 \text{ t/m}^3$, $\gamma_c = 3.15$, $f_{c,cement} = 400 \text{ kg/cm}^2$,
 $S_{fs} = 0.75$, $S_{fg} = 0.50$, $A_{is} = 1.80$, $A_{ig} = 1.90$ $A = 0.50$.

Question No. (3):

It is required to design a square column of 5.0 m clear height to carry a service load of 185 ton (Draw with suitable scale (1/10) the cross-section of designed column).

given data:-

- C250 - Steel 36 / 52 for main steel and Steel 24/ 35 for stirrups

(P.T.O.)



Question No. (4): (40%)

For the beam **AB** subjected to uniform and concentrated loads as shown in Figure (1), it is required the following:-

- 1- Calculate the reactions at supports A and B.
- 2- Draw the B.M.D and S.F.D.
- 3- Design the different critical sections.
- 4- Check the shear stresses and calculate the required bent bars if needed at column **B** left.
- 5- Draw with suitable scale the arrangement of longitudinal reinforcement.
- 6- Draw with suitable scale the critical sections.

Given data:-

- C225 with ($f_{c,rec} = 90 \text{ kg/cm}^2$, $q_1 \text{ shear} = 6 \text{ kg/cm}^2$ and $q_2 \text{ shear} = 18 \text{ kg/cm}^2$)
- Steel 36 / 52 with diameter $\phi 22 \text{ mm}$ (area one bar = 3.80 cm^2) for main steel.
- Steel 24/ 35 with 6 $\phi 8 \text{ mm/m}$ for stirrups should be used.
- $b = 25 \text{ cm}$ - $t_s = 12 \text{ cm}$ - The beam is 4.0 m apart (C.L. to C.L.).

• Table of K1 and K2 for steel 36/52 ($f_s = 2000 \text{ Kg/cm}^2$).

f_c	45	50	55	60	65	70	75	80	85	90	95
K1	0.438	0.401	0.371	0.347	0.324	0.306	0.289	0.276	0.263	0.250	0.243
K2	1832	1818	1806	1793	1782	1771	1761	1750	1740	1731	1722

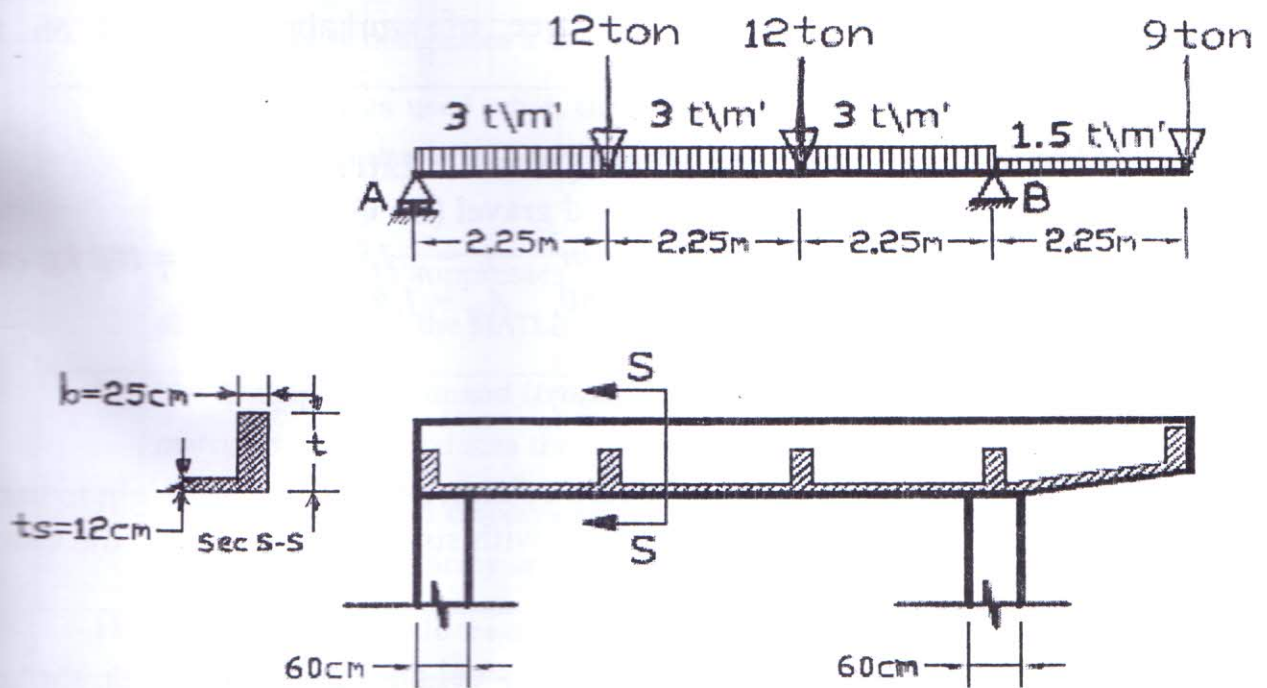


Figure (1)

Good Luck
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