

DRAW DIAGRAMS TO EXPLAIN YOUR ANSWER WHERE EVER REQUIRED

BE BRIEF AND ANSWER TO THE POINT

ASSUME MISSING DATA SUITABLY IF REQUIRED

1. A concrete prism of square cross-section (10 cm × 10 cm) and 50 cm long was subjected to a compressive force of 150 kN, the elastic modulus of the material is 30GPa. After instantaneous deformation the specimen is fully restrained, assuming elastic modulus remain same and all strains are within elastic limit, what will be stress in the specimen after six months when creep deformation is expected to be 10% of initial elastic deformation. Illustrate the phenomenon of relaxation through a diagram considering this case stated in the above problem. 6
2. Explain through a diagram "Mild steel exhibits a fixed endurance limit while concrete does not exhibit the same". How the fatigue strength of concrete is defined? 3
3. Calculate the gel porosity, capillary porosity and total porosity of typical hardened OPC cement paste of water to cement ratio being 0.32 at a time when hydration is fully complete. 4
4. Compound compositions of two cements "A" and "B", are given below, which cement would exhibit higher cumulative heat of hydration and higher 3 day strength for similar 28 day strength, assuming all other conditions remaining same.

Cement	C ₃ S	C ₂ S	C ₃ A	C ₄ AF	Rest
A	30	46	6	12	6
B	56	20	10	8	6

4

5. A brittle material is tested for its flexural strength, 6 samples were tested in one case, and 4 samples were tested in another case. Standard deviation is 0.5 MPa for the population of test results, known from past experience. Compare the error in both cases for 99.9% confidence level 3

3

$n = \left(\frac{z \times \sigma}{E} \right)^2$

$E = \frac{z \sigma}{\sqrt{n}}$

2.2
13.6
38.1

99.9
15.8
34.1

36
19
17

99.9