

TH1 Structural Design -I

Full Marks: 80

Time- 3 Hrs

Answer any five Questions including Q No.1& 2
 Figures in the right hand margin indicates marks

1. Answer **All** questions 2 x 10
 - a. Define modular ratio.
 - b. What do you mean by characteristic strength of concrete?
 - c. How do you determine the minimum depth of foundation?
 - d. What is curing?
 - e. Define Limit state. State various types of limit state.
 - f. Differentiate between one-way and two-way slab.
 - g. What is the minimum and maximum longitudinal reinforcement permissible in a column?
 - h. What do you mean by redistribution of moment?
 - i. Define slenderness ratio. What is its importance?
 - j. Draw a typical flight and show tread, riser, waist and going.
2. Answer **Any SIX** Questions 6 x 5
 - a. Write about advantages of LSM over WSM?
 - b. Design a short circular column to carry a service load of 1600KN use lateral ties and helical reinforcement. The materials are M20 grade concrete and Fe415 steel.
 - c. Design a square footing for a RCC column 250mmx250mm carrying a load of 300KN founded on soil that has SBC of 160KN/m² in LSM use M20 and Fe415 steel .
 - d. A steel bar of 10mm diameter of Fe415 grade is embedded in M20 concrete. Calculate its development length in tension and compression ($\theta = 90^\circ$).
 - e. Derive the stress block parameters for flexure.
 - f. Write the assumptions made in the limit state of collapse compression.
 - g. Explain in details why Under-reinforced section is preferred than Over reinforced section.
3. Design a simply supported rectangular beam in flexure to resist a factored load of 90KN/m. Given a clear span of 6m and the size is limited to 30cm x 60cm. Use M20 grade concrete and Fe500 steel. 10
4. A RCC beam of span 5m is 250mm wide 500mm deep (effective). It has 4 bars of 22mm tensile reinforcement. The beam carries a load of 30KN/m inclusive of self weight. Design the beam for shear. Use M20 concrete and Fe415 steel. 10
5. Design a dog legged staircase for a live load of 3 KN/m². Rise of the stair is 160mm and tread is 250mm, Ceiling height is 3.5m and width of flight is 150mm use M20 concrete and Fe415 steel. 10
6. Design a simply supported one way roof slab for a room 8mx3.5m clear in size if superimposed load is 5 KN/m² use M20 grade concrete a Fe415 steel. 10
7. Design a RCC column to resist axial factored load of 1800KN .Given column length of 3m with both end fixed using M20 grade concrete and Fe415 steel. 10