civil

# 4TH/CIVIL/ 2022(S)

## 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/$m^2$ 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 ($\emptyset = 90°$).
   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/$m^2$.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/$m^2$ 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