

(04 Hours)

Marks: 80

Instructions:

1. Question No. 1 is **Compulsory**.
2. Answer **any Three Questions** from the **remaining**.
3. Each **full question** carries **20 marks**.
4. **Assume** suitable data, if needed and **state** it clearly.
5. Use of **relevant IS codes** is **permitted**.

Q. 1 Answer **any four**.

- a) Explain the conditions for which an underground water tank is designed. 05
- b) Draw neat sketches showing the behavior of vertical stem wall and heel slab of counterfort retaining wall. What is the reason of providing vertical and horizontal ties in counterfort part? 05
- c) Write a note on open well staircase with a neat sketch. 05
- d) State various factors governing the seismic design. Explain any one factor. 05
- e) What are the advantages of pre-stressed concrete? 05

Q. 2 Design (4 m x 6 m) interior panel of a two-way continuous slab for a live load of 3000 N/m². Use M20 concrete and Fe415 steel. Draw neat sketch showing reinforcement details. Use limit state method. 20**Q. 3** Design a dog legged staircase for floor-to-floor height of 3.1 m subjected to live load of 3 kN/m² and floor finish of 1 kN/m². Available room size is (3.2 m x 5 m). Draw reinforcement details for both the flights. Use M20 grade of concrete and Fe415 steel. Use limit state method. 20**Q. 4** Design a RCC cantilever type retaining wall having a 5 m tall stem. The wall retains soil level with its top. The soil weighs 18000 N/m³ and has angle of repose of 30°. The safe bearing capacity of soil is 200 kN/m². Coefficient of friction between soil and concrete is 0.55. Use M20 concrete and Fe415 steel. Draw the reinforcement details. Use limit state method. 20**Q. 5** Answer the following

- a) Design a circular water tank resting on firm ground for the following particulars 10
Diameter of tank = 3.50 m
Depth of water – 3.00 m
Wall and base slab are not monolithic with each other
Specific weight of water = 9810 N/m³
Use M25 concrete and Fe415 steel. Use working stress method.
- b) What is the importance of ductile design and detailing in earthquake resisting structures? Discuss in detail. 10

Q. 6 Answer the following

- a) What are different types of losses in pre-stressed concrete? Explain loss due to creep of concrete. 10
- b) Write a short note on various joints in water tank. 10