BIRLA INSTITUTE OF TECHNOLOGY AND SCIENCE, PILANI

Advanced Concrete Structures (CE G613)– Comprehensive Examination (Second Semester 2022-2023)

Duration: 3 hours (Closed book) **Date: 11-05-2023** **Max. Marks: 40**

---

1. (a) Explain the tension-stiffening effect in a reinforced concrete beam. **[2 Marks]**
(b) How to control deflection and cracking in a reinforced concrete beam? **[2 Marks]**
(c) What is the difference between lower-bound and upper-bound methods? **[2 Marks]**
(d) Why brick lining is essential for the design of chimneys? **[2 Marks]**
(e) Write two advantages of the Intz-water tank. **[2 Marks]**
(f) What is the portal frame method? Also, mention the assumptions in this method. **[2 Marks]**
(g) What are the drawbacks of the working stress and ultimate load methods? **[2 Marks]**

2. Derive the expressions of collapse load and location of plastic hinge for the one-way slab of length L in terms of support moments M_A and M_B and span moment Mc at hinge location using the **Virtual work method**. Determine the values of collapse load and location of the plastic hinge if M_A=32 kNm, M_B=25 kNm and Mc=18 kNm. Consider that the length of the slab is equal to 5 m. **[6 Marks]**

3. A right-angled triangular slab is simply supported along the longest side, has a free edge along the shortest side, and the remaining side is clamped. The length of the three sides of the right-angled triangular slab is 3 m, 4 m, and 5 m. The ultimate positive moment capacities along both the x-direction and y-direction are 30 kNm/m. The negative moment capacity is equal to two-thirds of the positive moment capacity. Determine the uniformly distributed collapse load using the **Virtual work method**. **[4 Marks]**

4. A rectangular slab, 4 m x 8 m with fixed support at all four sides, has a central opening of 1 m x 2 m. The slab carries a uniformly distributed factored load of 12 kN/m^2, including self-weight. Determine the load dispersions and moments to be resisted at all critical sections of the slabs. **[8 Marks]**

5. Find the elastic, redistributed, and design bending moment diagrams of a continuous beam in **Fig. 1.** Assume full redistribution of 30% as per IS 456. **[8 Marks]**

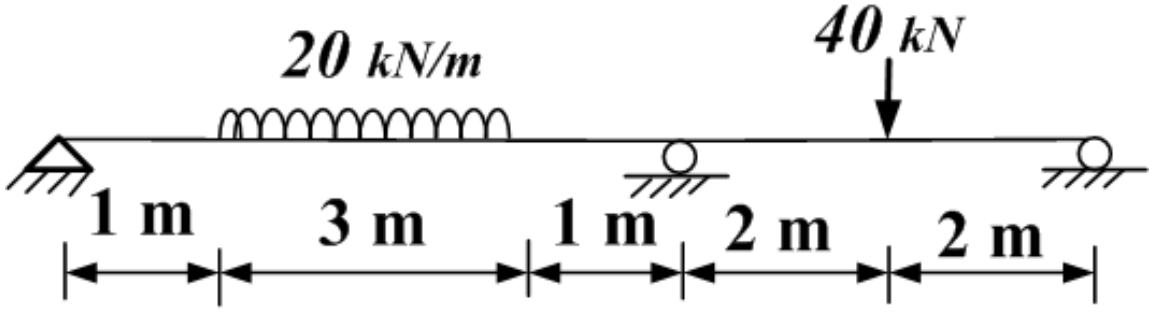

Fig. 1