Total number of printed pages:02 **UG/8th/UCE802**

2023

DESIGN OF STRUCTURES - III

Full Marks : 100

Time : Three hours

The figures in the margin indicate full marks for the questions.

*Answer **any five** questions.*

Use of IS:456-2000, IS:800-2007 and IS:883:1994 are allowed

1. State the assumptions made in portal method of frame analysis. And analyze the frame shown in figure-1 by portal method also draw the bending moment diagram. Take EI as constant for all the members. 20

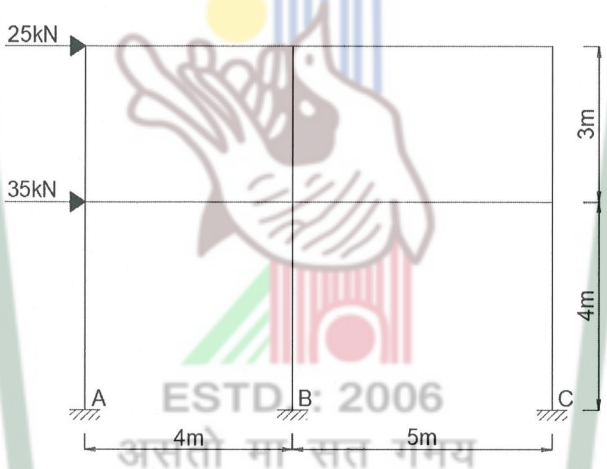

Figure-1

2. Design a longitudinally spanning dog-legged RCC stair for a residential building. The stair is supported on 300mm width RCC beam at the end of the landing. Landing for the stair is provided only at one end. Consider ceiling height as 3.2m and RCC slab thickness as 125mm. Take live load as 3.0 kN/m^2 and floor finish as 1.0 kN/m^2. Take width of the stair as 1.0m. Use M20 concrete and Fe 500 steel. 20

3. Design a RCC circular water tank of 75,000 litres capacity. The wall of the tank is rigidly joined with the base and is resting on a firm ground. The height of the tank is 5m. Use M30 grade of concrete and Fe 415 steel. For any missing data, assume suitably. 20

4. Design a footbridge for the following data. Assume, suitably for any missing data. 20

(a) Span 18m c/c
(b) Cross-girder spacing = 2.5 m c/c
(c) Clear working width between main girder = 2.0 m c/c
(d) Live load = 3.0 kN/m^2
(e) Flooring – Timber plank

5. a) State the assumptions made in prestress concrete. 03

b) An unsymmetrical I-section PSC beam carries a load of 12kN/m. The span of the beam is 6m, top flange 300mm wide and 60mm thick and bottom flange 150mm and 50mm. Thickness of web is 80mm. Overall depth of the beam is 400mm. At the centre of the span the effective prestressing force of 120kN and is located at 50mm from the soffit of the beam. Estimate the stresses at the centre of span section of the beam for the following load conditions: 17

a) Prestress + Self weight

b) Prestress + Self weight + LL

6. a) Explain the various long-term losses in PSC. 07

b) A prestressed concrete beam of 300mm deep and 200mm wide is prestressed by 10 wires of 7mm diameter initially stressed to 1200N/mm^2. Their centroids are located at 100mm from the soffit. Find the maximum stress in concrete immediately after transfer allowing only for elastic shortening of concrete. If concrete undergoes further shortening due to creep and shrinkage while the relaxation in steel is 5% of steel stress, estimate the final % loss of stress in wires. Take E_s = 210 kN/mm^2, E_c = 36900 N/mm^2, Creep coefficient = 1.6 and shrinkage strain = 3 x 10^{-4}. 13