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

2025

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

Q.No.1. State the assumptions made in portal method of frame analysis. And analyze the frame shown in figure-1 by portal method. Take EI as constant for all the members. **02+18=20**

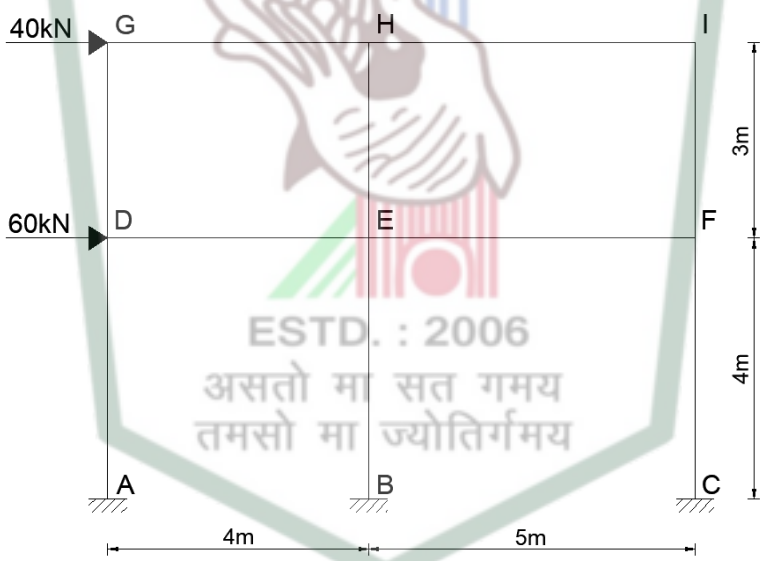

Figure-1

Q.No.2 Design a longitudinally spanning dog-legged RCC stair for a residential building. The stair is supported on 300mm width RCC beam at the ends of the landing. Landing for the stair is provided at both ends. The stair has 10 numbers of treads having a dimension of 250mm. Take live load as 3.0 kN/m^2 and floor finish as 1.0 kN/m^2. Width of the stair is 1.0m. Use M20 concrete and Fe 500 steel. **20**

Q.No.3 Design a RCC circular water tank of 6,00,000 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 4.5m and free board provided is 300mm. Use M30 grade of concrete and Fe 415 steel. **20**

Q.No.4 Design a footbridge for the following data. Assume, suitably for any missing data. **20**

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

Q.No.5 (a) State the assumptions made in prestress concrete. **03**

(b) A PSC beam supports an imposed load of 6kN/m over a simply supported span of 9m. the beam has an 'I' section with an overall depth of 450mm. the thickness of flange and web are 75mm and 100mm respectively. The width of the flange is 230mm. the beam is to be prestressed by an effective prestressing force of 400kN at a suitable eccentricity such that the resultant stress at the soffit of the beam at the centre of the span is zero. Find the eccentricity required for the force. Also find the magnitude of prestressing force for the resultant stress to be zero at mid-span if the tendons are concentric **17**

Q.No.6 (a) Explain the losses in PSC due to: (i) Elastic deformation, (ii) Shrinkage of concrete and (iii) Creep of concrete. **09**

(b) A prestressed concrete beam 250mm wide and 400mm deep is prestressed with wires of area = 350mm^2 located at a constant eccentricity of 50mm and carrying an initial stress of 1500N/mm^2. The span of the beam is 12m. Calculate the percentage loss of stress in wires if, **11**

i. The beam is pre-tensioned and
ii. The beam is post-tensioned

Take E_s = 210 kN/mm^2, E_c = 35kN/mm^2, relaxation of steel stress = 5% of initial stress, ϵ_{cs}= 300 x10^{-6} for pre-tensioned, ϵ_{cs}= 200 x10^{-6} for post-tensioned, ϕ = 1.6 and slip at anchorage = 1.2mm

----------xxxxx----------