Total number of printed pages–4

53 (CE 801) DGST–III

2021

DESIGN OF STRUCTURES–III

Paper : CE 801

Full Marks : 100

Time : Three hours

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

*Answer **any five** questions.*

1. *(a)* What do you understand by prestressed concrete and what are the advantages of prestressed concrete? 5

   (b) A prestressed concrete beam of rectangular section 300*mm* wide and 700*mm* deep has a span of 10*m*. The effective prestressing force is 1400*kN* at an eccentricity of 150*mm*. The dead load of beam is 9·0*kN*/*m* and the beam has to carry a live load of 10*kN*/*m*. Determine the extreme stresses in concrete at : 15

   (i) Ends of the beam without the action of live load.

Contd.

(ii) At the mid-section without the action of live load.

(iii) At the mid-section with the action of live load.

2. (a) Briefly explain the various losses in prestressed concrete. 8

(b) A prestressed concrete beam of 250mm wide and 350mm deep is prestressed with wires (area = 400mm^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, the beam is prestressed. Take $E_s = 210 kN/mm^2$, $E_c = 35 kN/mm^2$, relaxation of steel = 5% of initial stress, shrinkage strain of concrete = 300×10^{-6}, creep coeff. = 1·6. 12

3. Design a dog-legged stair for an office building, given the following data :

Floor to ceiling height = 3·2m

Width of flight = width of landing = 1·25m

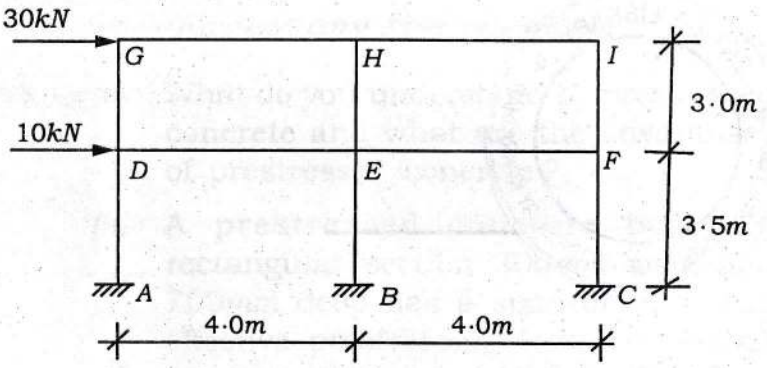
Live load = 5·0kN/m^2 and

Floor finish = 0·7kN/m^2.

Assume the stair to be supported on a beam of 300*mm* wide at the outer edges of landing, parallel to the risers. Use M 20 concrete and Fe 500 steel. Assume mild exposure condition. 20

4. *(a)* What are the assumptions made in cantilever method of analysis ? 2

(b) Analyse the frame shown in *Figure*–1 by Cantilever method. And draw the axial force, shear force and bending moment diagrams. 18



Figure–1

5. Design an open-rectangular water tank for a capacity of 65,000 litres resting on a firm ground. Use M 30 concrete and Fe 415 steel. 20

6. Design a steel foot-bridge for the following given data : 20

(i) Span of girder = 16*m c/c*

(ii) Cross girder to be spaced at 2*m c/c*

(iii) Clear working width betwen main girders = 2·25*m*

(iv) Live load = $5kN/m^2$

(v) Flooring–Timber plank.

Assume any missing data.