

AE (Civil) P.H. Engg. Dept. Exam - 2016

CIVIL ENGINEERING – PAPER - I

Time : 3 Hours

Max. Marks : 200

Note : 1. Attempt any five (05) questions. All questions carry equal marks.

2. Indian Standard Code of Practice for Prestress Concrete IS 1343-1980 is required

- Determine the ultimate moment of resistance for the T-beam section of effective width of 850 mm shown below (Fig. 1). Assume M20 grade concrete and Fe 250 grade steel. (40)

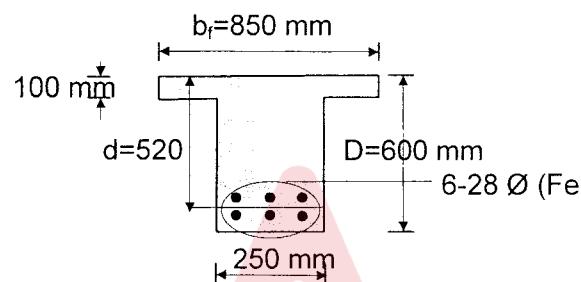


Fig. 1

- Design shear-reinforcement for the doubly reinforced beam shown in Fig. 2. The beam is simply supported with a total centre-to-centre span of 6.0 m. Use 8 mm ϕ vertical stirrups made of Fe 250 steel. The shear at the bar-cutoff point (860 mm from centre of support) also needs to be checked. The concrete is of M25 and flexural steel of Fe 415. (40)

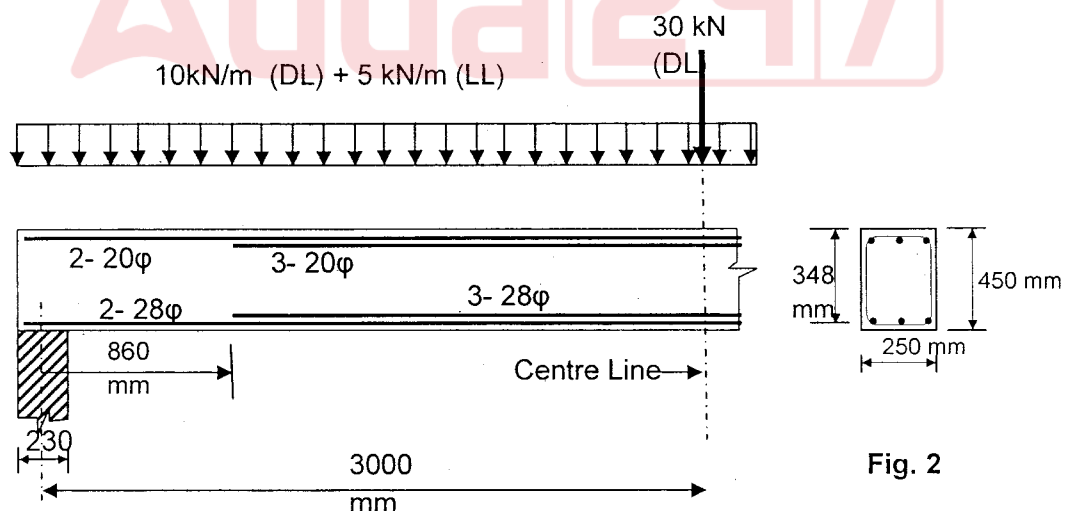


Fig. 2

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3. A pretensioned beam 200 mm wide and 300 mm deep is prestressed by 10 wires of 7 mm diameter initially stressed to 1200 N/mm^2 , with their centroids located 100 mm from the soffit. Find the maximum stress in concrete immediately after transfer, allowing only for elastic shortening of concrete.
- If the concrete undergoes further shortening due to creep and shrinkage while there is relaxation of 5 % steel stress, estimate the percentage loss of stress in the wires, using the IS code (IS 1343-1980) regulations, and the following data (40)
- $E_s = 210 \text{ kN/mm}^2$
 $E_c = 5700 (f_{cu})^{1/2}$
 $f_{cu} = 42 \text{ N/mm}^2$
 Creep coefficient $\phi = 1.6$
 Total residual shrinkage strain = 300×10^{-6}

4. Generate the stiffness matrix for the beam with respect the coordinates shown in the Fig.3 (40)

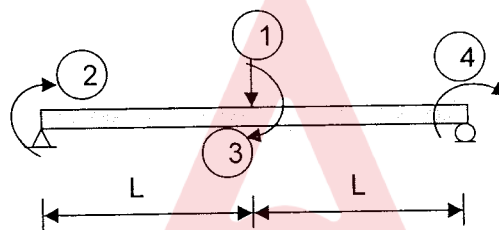


Fig. 3

5. Find the collapse load for the portal frame shown in Fig. 4 (40)

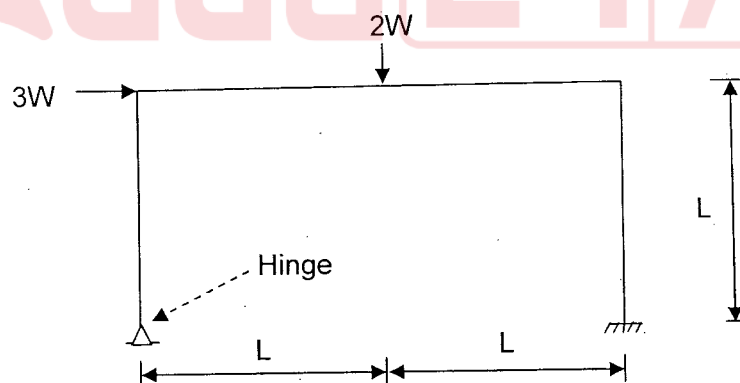


Fig. 4

6. A 300 I.S.F 8 mm is used as a tension member in a lattice girder. It is connected to a 12 mm gusset plate by 18 mm ϕ hand-driven rivets. The yield stress of steel is 250 N/mm^2 . Calculate the maximum force that the member can carry, if (40)
- Chain riveting is done as shown in Fig. 5a
 - Zig-zag riveting is done as shown in Fig. 5b

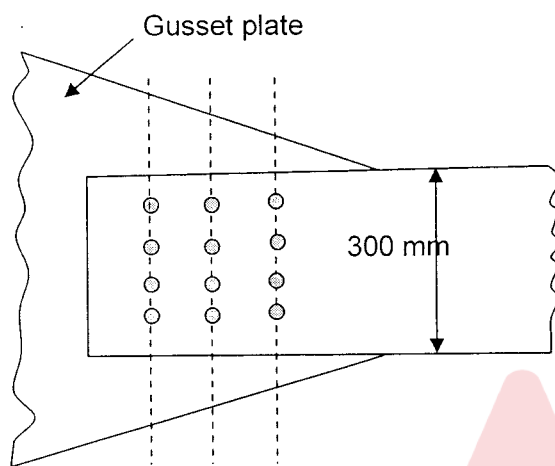


Fig. 5b) Zig-zag riveting

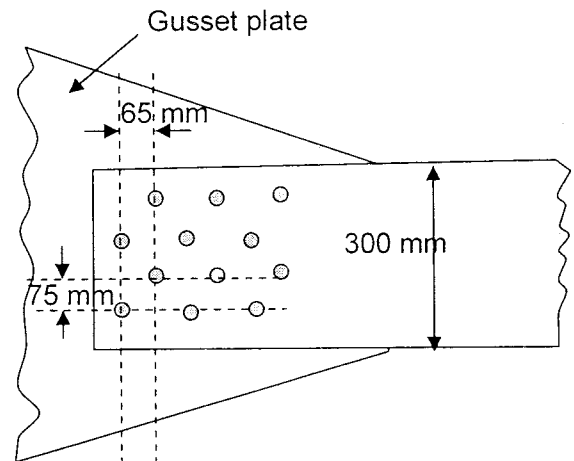


Fig. 5a) Chain riveting

7. A rectangular block $250 \text{ mm} \times 100 \text{ mm} \times 80 \text{ mm}$ is subjected to axial load as follows: (40)
- 480 kN tensile in the direction of its length
 - 900 kN tensile on the $250 \text{ mm} \times 80 \text{ mm}$ faces
 - 1000 kN compressive on the $250 \text{ mm} \times 100 \text{ mm}$ faces
- Assuming Poissons's ratio as 0.25, and Young's modulus to be $2 \times 10^5 \text{ N/mm}^2$, evaluate the following.
- Volumetric strain
 - The change in volume of the block due to the application of the above load
 - Modulus of rigidity and bulk modulus for the material