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ET-508(A)

B.Tech. Civil (Construction Management) / B.Tech. Civil (Water Resources Engineering)

Term-End Examination

00263 **December, 2018**

ET-508(A) : STRUCTURAL DESIGN – I

Time : 3 hours *Maximum Marks : 70*

Note : *Attempt any **four** questions. All questions carry equal marks. Use of code of practice IS : 456 and scientific calculator is permitted. Assume missing data suitably.*

1. Find the moment of resistance of a beam, 150 mm wide and 350 mm deep, if it is reinforced with 3 – 14 mm diameter bars in tension zone, at an effective cover of 40 mm as shown in Figure 1. Assume M 15 mix of concrete and Fe 250 grade steel. Use limit state method of design. $17\frac{1}{2}$

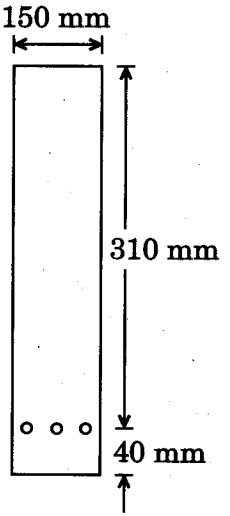

Figure 1

2. Design a doubly reinforced section for a rectangular beam at mid span having an effective span of 4 m. The total load is 42·5 kN/m (which includes self weight of beam also) and size of beam is limited to 250 mm × 400 mm overall. Use M 20 mix concrete and Fe 415 grade steel. Use limit state method of design. $17\frac{1}{2}$

3. Determine :

   (i) Depth of neutral axis,

   (ii) Moment of resistance, and

   (iii) Percentage of steel

   of a balanced singly reinforced beam of size 200 mm × 300 mm (effective) if the allowable stresses in concrete and steel are 5 N/mm^2 and 140 N/mm^2 respectively. Assume m = 19. Use working stress method of design. $17\frac{1}{2}$

4. Design shear reinforcement in the form of vertical stirrups for a beam having a cross-section of 250 mm × 500 mm. The beam is reinforced with 4 – 20 mm diameter bars at an effective cover of 40 mm. The shear force at the cross-section is 85 kN. Use M 15 concrete and Fe 415 steel. Use limit state method of design. $17\frac{1}{2}$

5. Design a short square column to carry an axial load of 1200 kN. Use M 25 concrete mix and take σ_{sc} as 130 N/mm^2. Use working method of design. $17\frac{1}{2}$

6. Show that for yield line analysis of one way slabs

$$(M_j - M_i)\, x^2 + 2(M_i + M_o)\, Lx - (M_i + M_o)\, L^2 = 0$$

where all the terms have their usual meaning. $17\frac{1}{2}$