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ET-508(A)

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

Term-End Examination

01354

December, 2014

ET-508(A) : STRUCTURAL DESIGN – I

Time : 3 hours *Maximum Marks : 70*

Note : *Attempt any **four** questions. All questions carry equal marks. Use of IS-456 and scientific calculator is allowed. Any missing data may be assumed suitably.*

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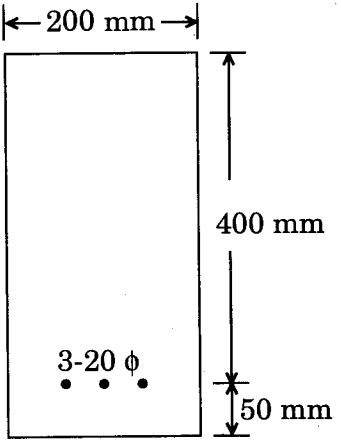
1. Determine the moment of resistance of a rectangular beam 200 mm wide and 450 mm deep, if it is reinforced with 3-20 mm diameter Fe 250 grade steel bars in tension. Assume M 15 concrete. Effective cover to reinforcement is 50 mm. Use limit state method of design. $17\frac{1}{2}$



2. Design a doubly reinforced section for a rectangular beam at midspan having a simply supported effective span of 4 m. The superimposed load is 40 kN/m and size of beam is limited to 250 mm × 400 mm overall. Use M 20 mix and Fe 415 grade steel. Use limit state method of design. $17\frac{1}{2}$

3. Design a short square column to carry an axial load of 1,000 kN. Use M 25 mix and σ_{sc} as 130 N/mm^2. Use working stress method of design and show the reinforcement details with the help of a neat sketch. $17\frac{1}{2}$

4. The cross-section of a simply supported reinforced beam is 200 mm wide and 300 mm deep to the centre of reinforcement, which consists of 3 bars of 16 mm diameter. Determine from the first principles the depth of N.A. and the maximum stress in concrete when steel is stressed to 120 N/mm^2. Take m = 19 and use working stress method of design. $17\frac{1}{2}$

5. An RC beam has an effective depth of 500 mm and a breadth of 350 mm. It consists of 4-25 mm diameter bars. If f_{ck} is 15 N/mm^2 and f_{sv} is 250 N/mm^2, calculate the shear reinforcement needed for a factored shear force of 350 kN. $17\frac{1}{2}$

6. Design a square spread footing to carry a column load of 1,000 kN from a 400 mm square tied column containing 20 mm diameter bars as the longitudinal steel. The bearing capacity of soil is 100 kN/m^2 considering base of footing at 1 m below the ground level. The unit weight of earth is 20 kN/m^3. Use limit state method of design and take f_{ck} as 15 N/mm^2, f_y as 415 N/mm^2 and load factor as 1·5. $17\frac{1}{2}$

7. Show that for yield 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 meanings. $17\frac{1}{2}$