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ET-508(A)

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

Term-End Examination

00670

June, 2016

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 code and scientific calculator is allowed. Any missing data may be assumed suitably.*

1. (a) A section of a reinforced beam having width as 300 mm and depth as 550 mm is subjected to a service load moment of 175 kNm. Assume M 20 concrete and Fe 415 steel with $d' = 50$ mm, $\sigma_{cbc} = 7$ MPa and $\sigma_{st} = 130$ MPa. Determine the stresses in concrete and steel at the section. *10*

   (b) Determine the ultimate moment of resistance for a T-section having $b_f = 850$ mm, $D_f = 100$ mm, $b_w = 250$ mm, $d = 520$ mm and $A_{st} = 3695$ mm^2. Assume M 25 concrete and Fe 415 steel. All notations have their usual meaning. $7\frac{1}{2}$

2. Determine the ultimate moment of resistance of a doubly reinforced section with the following data :

$b = 300$ mm, $d = 655$ mm , $d' = 45$ mm,
$A_{sc} = 982$ mm^2, $A_{st} = 1964$ mm^2.
Consider M 25 concrete and Fe 415 steel. $17\frac{1}{2}$

3. Design a one-way slab, with a clear span of 4·0 m which is simply supported on 230 mm thick masonry walls. It is subjected to a live load of 4 kN/m^2 and surface finish of 1 kN/m^2. Take Fe 415 steel and M 25 concrete. Assume that the slab is subjected to moderate exposure conditions. $17\frac{1}{2}$

4. (a) Design the reinforcement in a column of size 450 mm × 600 mm, subjected to an axial load of 2000 kN under service load conditions. The column has an unsupported length of 3·0 m and is braced against sideway in both directions. Use M 25 concrete and Fe 415 steel. 10

(b) Discuss various stability conditions for a long column. $7\frac{1}{2}$

5. Design an isolated footing for a square column, 450 × 450 mm, reinforced with 8 – 25 ϕ bars, and carrying a service load of 2300 kN. Assume soil with a safe bearing capacity of 300 kN/mm^2 at a depth of 1·5 m below ground. Assume M 20 grade concrete and Fe 415 grade steel for the footing. $17\frac{1}{2}$

6. Design the stem of a cantilever wall to retain earth with a backfill sloped at 20° to the horizontal at the top of the wall which is 5·5 m above the ground level. Its foundation depth may be taken as 1·2 m below the ground which has a safe bearing capacity of 120 kN/m^2. Assume that the backfill has a unit weight of 17 kN/m^2 and an angle of shearing resistance of 35°. Coefficient of friction between soil and concrete may be taken as 0·55. Use M 20 concrete and Fe 415 steel. $17\frac{1}{2}$