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ET-508(A)

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

Term-End Examination

June, 2011

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

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1. Find the moment of resistance of a beam, 250 mm. wide by 500 mm. deep, if it is reinforced with 2-12 mm. diameter bars in compression and 4-20 mm. diameter bars in tension, each at an effective cover of 40 mm, as shown in figure - 1. Assume M 15 concrete and Fe 250 grade steel. Use limit state method of design. **17½**

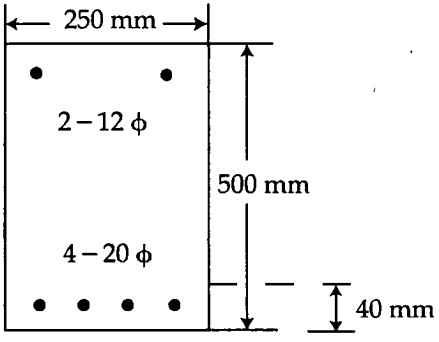

Fig. 1

2. A rectangular beam is 200 mm. wide and 400 mm. deep upto the centre of reinforcement. Find the reinforcement required if it has to resist a moment of 25 kNm. Assume ´ 15 mix and Fe 415 grade steel. Critical depth of neutral axis can be calculated by following formula : 17½

$Xu_{max} = 0.514d.$

Use limit state method of design.

3. A doubly reinforced concrete beam is 400 mm. wide and 600 mm. deep to the centre of tensile reinforcement. The compression reinforcement consists of 4-16 mm. diameter bars and is placed with its centre at a depth of 40 mm. from the top. The tensile reinforcement consists of 4-20 mm. diameter bars. The section is subjected to a bending moment of 100 kN m. Determine the stresses in concrete and steel. Take m = 16. Use working stress method of design. 17½

4. Design shear reinforcement for a RC beam at support for the following data : 17½

width = 400 mm, effective depth = 760 mm, total depth = 800 mm, shear force = 100 kN, M 15 concrete and Fe 250 steel. The tensile reinforcement consists of 5 - 20 mm diameter bars, out of which two bars are bent up at 45° near the support to take shear.

5. Design a long column 10 m long to carry an axial load of 600 kN. The column is restrained at the ends. Consider M25 concrete and permissible stress in longitudinal steel as 130 N/mm^2. Use working stress method of design. **17½**

6. Show that for yield line analysis of a two-way square slab with all edges fixed, $w = \frac{48\ Mo}{L^2}$. All the terms have their usual meanings. **17½**

7. Design a rectangular footing for a superimposed load of 1000 kN. The safe bearing capacity for soil is 250 kN/m^2. Use M 25 concrete and Fe 415 steel. Take size of column as 600×400 mm. **17½**