

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

**Term-End Examination**

**June, 2010**

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

1. Find the moment of resistance of a beam  $17\frac{1}{2}$  m long, 250 mm x 500 mm deep, if it is reinforced with 2-12 mm dia bars in compression zone and 4-20 mm dia bars in tension zone, each at an effective cover of 40 mm, as shown in fig : 1. Assume M 15 mix of concrete and Fe 415 grade steel. Use limit state method.

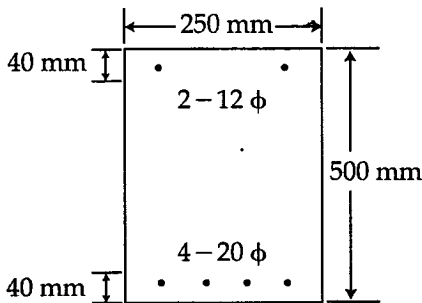


Fig-1

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 40 kNm. Assume M 20 mix and Fe 415 grade steel. Use limit state method of design. 17½
  
3. Determine (i) depth of neutral axis (ii) moment of resistance (iii) percentage of steel of a balanced singly reinforced beam of size 200 mm x 300 mm (effective) if the allowable stresses in concrete and steel are 5 N/mm<sup>2</sup> and 140 N/mm<sup>2</sup> respectively. Assume  $m = 19$  17½
  
4. Design shear reinforcement, providing vertical stirrups, for a beam having a cross - section of 250 mm x 500 mm (overall). The beam is reinforced with 4-20 mm dia bars and has an effective cover of 40 mm. The shear force at the cross - section is 85 kN. Use M 15 concrete and Fe 415 steel. 17½
  
5. Design a short square column to carry an axial load of 1200 kN. Use M 25 concrete mix and take  $\sigma_{sc}$  as 130 N/mm<sup>2</sup>. 17½
  
6. Show that for yield line analysis of one way slabs  $(M_j - M_i) x^2 + 2 (M_i + M_o) L x - (M_i + M_o) L^2 = 0$  17½  
Where all the terms have their usual meaning.