Ex/BESUS/CE-501/09

B.E. (CE) Part-III 5th Semester Examination, 2009

Design of R.C. Structures
(CE-501)

Time : 3 hours **Full Marks : 70**

Use separate answerscript for each half.
Answer SIX questions, taking THREE from each half.
The questions are of equal value.
Two marks are reserved for neatness in each half.
Assume any data needed suitably.

FIRST HALF

1. Design a slab for an office building floor supported on beams and columns located on a grid, the c/c dimensions of which are 4.2 m x 3.5 m. Two adjacent edges of the slab are discontinuous. Take live load as 4.0 kN/m^2. Following co-efficients are given :

$\frac{l_y}{l_x}$	1.0	1.2	long span coefficients for all $\frac{l_y}{l_x}$	
$-\alpha_x$	0.047	0.060	$-\alpha_y$	0.047
$+\alpha_x$	0.035	0.045	$+\alpha_y$	0.035

Use M-20 grade concrete and Fe-415 steel. Assume modification factor = 1.1. Use limit state method.

2. Design a staircase for a residential building with following data : Floor to floor height = 3.3 m, width of stair = 1.5 m, total length = 5.5 m. Assume M-20 grade concrete and Fe-415 steel. The live load is 3.0 kN/m^2. Use limit state method.

3. a) A rectangular beam of width 250 mm and depth 525 mm subjected to a factored moment Mu = 200 kN-m. Find out the necessary reinforcement to carry above moment safety.
   b) Also design for shear if the beam is subjected to a shear force Vu = 300 kN. Assume $\tau_c = 0.6$ N/mm^2.

4. Column A_1 of size 450 mm x 450 mm is subjected to an axial load of 360 kN and column A_2 of size 550 mm x 550 mm is subjected to an axial load of 450 kN. The c/c distance between the columns is 4.0 m. Design a combined rectangular footing for these two columns. Assume allowable bearing capacity of soil as 90 kN/m^2. Use M-20 grade concrete and Fe-415 steel and limit state method of design.

5. Find the axial load carrying capacity (Pu) and uniaxial moment carrying capacity (Mu) about minor axis for a column of dimension b and D (b<D). Given : $\frac{x_u}{d} = 1.2$, $\frac{d1}{D} = 0.1$, 12 bars equally placed total steel, p = 2.5%, Grade of concrete is M-20 and grade of steel is Fe-250.
Assume any data suitably. The notations have their usual meaning.

SECOND HALF

6. A roof slab of a room is supported on all four brick masonry walls of 300 mm thick. The inside dimensions are 3.0 m x 6.5 m. Using working stress method design the slab and show the reinforcement detail. Use Grade of concrete M20 and Grade of steel Fe415. Live load on roof slab = 1.5 kN/m^2.
Assume $\tau_c = 0.33$, $\tau_{bd} = 1.28$ and modification factor = 1.5.

7. Design a simply supported beam of span 6 m carrying uniformly distributed live load 12 kN/m. Use grade of concrete M20 and grade of steel Fe250. Draw also the detail of reinforcement. Assume modification factor = 1.4. Use working stress method of design.

8. A rectangular R.C. column of one end fixed and the other end hinged. The column is subjected to an axial load of 60 tons. The width of column is 250 mm. The height of the column is 3.5 m. Use grade of concrete M25 and grade of steel Fe415. Design the column using working stress method.

9. Design an isolated footing using working stress method for a column carrying axial load 800 kN. The size of the column section is 350 mm x 350 mm. The bearing capacity of soil is 150 kN/m^2. Use grade of concrete M20 and grade of steel Fe415. Assume $\tau_c = 0.35$ N/mm^2.

10. Determine the moment of resistance using working stress method of a of flange width 1200 mm, depth of flange 100 mm, width of rib 250 mm, tensile reinforcement 5 nos. 20 mm dia bars in the bottom of the rib, the clear cover 50 mm and overall depth 450 mm. Assume grade of steel 415 and grade of concrete M20.

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