

Roll No.

CE-504

B. E. (Fifth Semester) EXAMINATION, June, 2009

(Civil Engg. Branch)

STRUCTURAL DESIGN AND DRAWING – I

(CE – 504)

Time : Three Hours

Maximum Marks : 100

Minimum Pass Marks : 35

Note : Attempt any *five* questions. Assume suitable data if necessary. Use of IS-456 is permitted. All questions carry equal marks.

1. How do you find the moment of resistance of a beam section ? working from the first principle, determine the moment of resistance and percentage of steel in a singly reinforced rectangular section ($b \times d$) for a balanced design, if the stress in concrete and steel are not to exceed 5 N/mm^2 and 140 N/mm^2 respectively. Take $m = 18$.
2. 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 bars of 16 mm diameter, and is placed with its centre at a depth of 40 mm from the top. The tensile reinforcement consists of 4 bars of 20 mm diameter. The section is subjected to a bending moment of 100 kNm. Determine the stresses in concrete and steel. Take $m = 16$.

3. A simply supported one-way R. C. C. slab of clear span 3.0 m is supported on walls 350 mm thick and subjected to a live load of 2 kN/m^2 . Use M20 grade concrete and mild steel reinforcement. Find the depth of slab and main and distribution reinforcement required.
4. Design a two-way slab for a room of size $(5 \times 4) \text{ m}$ (effective size). The superimposed load is 4 kN/m^2 .
5. An isolated T beam having span of 5.5 m, flange width 900 mm, web width 300 mm, flange thickness 100 mm and effective depth 600 mm. The beam is reinforced with 4-25 mm dia bars in tension. Compute the maximum stresses in concrete and steel. Also determine allowable moment. Use M20 and Fe415 steel.
6. A short R. C. C. column has to carry an axial load of 500 kN. It is having a square cross-section. Find the size of the column and reinforcement required for main bars as well as lateral ties. Use M20 grade of concrete and Fe415 steel.
7. Design a footing for a column using the following data :
 - (i) Factored load on column — 1600 kN
 - (ii) Effective length of column — 3.2 m
 - (iii) Size of column $400 \times 400 \text{ mm}$ and reinforced with 8—20 mm dia bar
 - (iv) Safe bearing capacity of soil — 120 kN/m^2Use M20 concrete grade and Fe415 steel grade.
8. Design a dog-legged stair for a building in which vertical distance between floor is 3.5 m. The stair hall measures $2.5 \text{ m} \times 5 \text{ m}$. The live load is 4 kN/m^2 . Use M20 grade concrete and Fe415 steel.