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BICE-013

B.Tech. CIVIL ENGINEERING (BTCLEVI)

Term-End Examination

June, 2015

00646

BICE-013 : STRUCTURAL DESIGN AND DRAWING – I

Time : 3 hours *Maximum Marks : 70*

Note : *Answer any **seven** questions. IS : 456 – 2000 code is allowed. IS : 800 – 2007 code is allowed. Use of scientific calculator is permitted. All questions carry equal marks.*

1. For a balanced rectangular section (b × d) of a singly reinforced beam, determine the following : *10*

(a) Depth of neutral axis

(b) Moment of resistance

(c) Percentage of steel using M-20 grade concrete and Fe-415 steel

(d) Effective cover

2. A reinforced concrete slab has effective span of 4 m and carries a uniformly distributed load of 6 kN/m^2 inclusive of its own weight. Determine

(a) effective depth of slab,

(b) steel reinforcement.

Use M-20 grade of concrete and Fe-250 steel. σ_{cbc} = 5 N/mm^2, σ_{st} = 140 N/mm^2. *10*

3. A straight stair in a residential building is supported on wall on one side and stringer beam on the other side. The risers are 150 mm and the treads are 250 mm and the horizontal span of the stairs may be taken as 1·2 metres. Design the steps. *10*

4. (a) A reinforced concrete column 4 m long (effective) and 400 mm in diameter is reinforced with 8 bars of 20 mm diameter. Find the safe load of column carry. Take M-20 grade concrete and Fe-415 steel reinforcement. The column carries lateral ties.

   (b) If the effective length is increased to 8 m, what will be the safe load that the column can carry ? *10*

5. Write the different structural components of a cantilever retaining wall. Show with a suitable sketch the reinforcement detailing of a cantilever retaining wall. *10*

6. A single riveted lap joint is used to connect plates 10 mm thick. If 20 mm diameter rivets are used at 55 mm gauge, determine the strength of the joint and its efficiency.

   Working stress in shear in rivets = 80 N/mm^2 (MPa).

   Working stress in bearing in rivets = 250 N/mm^2 (MPa).

   Working stress in axial tension in plates = 0·6 f_y,

   f_y = 260 N/mm^2. *10*

7. Design a rolled beam section column to carry axial load 1100 kN. The column is 4 m long and adequately restrained in position but not in direction, at both ends. *10*

8. A column section HB 250 @ 0·510 kN/m carries an axial load of 600 kN. Design a slab base for the column. The allowable bearing pressure on concrete is 4 N/mm^2. The allowable bending stress in the slab base is 185 N/mm^2 (MPa). *10*

9. Design a simply supported beam to carry a uniformly distributed load of 44 kN/m. The effective span of the beam is 8 metres. The effective length of compression flange of the beam is also 8 m. The ends of the beam are not free to rotate at the bearings. *10*

10. Write short notes on the following : $4 \times 2\frac{1}{2} = 10$

    (a) Difference between working stress method of design and limit state method of design

    (b) Grillage foundation

    (c) Difference between isolated and combined footings

    (d) M-30 grade concrete
