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BICE-013

B.Tech. CIVIL ENGINEERING (BTCLEVI)

Term-End Examination

December, 2015

**BICE-013 : STRUCTURAL DESIGN AND
DRAWING - I**

Time : 3 hours

Maximum Marks : 70

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

1. 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) Efficiency of a joint
 - (c) Gusseted base
 - (d) Combined footing and isolated footing
2. Write the different structural components of a counterfort retaining wall. Show with a suitable sketch the reinforcement detailing of a cantilever retaining wall. 10

3. Determine the moment of resistance of a singly reinforced beam 160 mm wide and 300 mm deep to the centre of reinforcement, if the stresses in steel and concrete are not to exceed 140 N/mm^2 and 5 N/mm^2 . The reinforcement consists of 4 bars of 16 mm diameter. Take $m = 18$. If the above beam is used over an effective span of 5 m, find the maximum load the beam can carry inclusive of its own weight. 10

4. Find the moment of resistance of an existing T-beam having the following data :

$$b_f = 740 \text{ mm}, d = 400 \text{ mm}, b_w = 240 \text{ mm}, \\ d_f = 100 \text{ mm}, \text{M-15 concrete.}$$

Use limit state method of design. 10

5. Design a rectangular isolated footing of uniform thickness for R.C. column bearing a vertical load of 600 kN and having a base size of $400 \times 600 \text{ mm}$. The safe bearing capacity of the soil may be taken as 120 kN/m^2 . Use M-20 concrete and Fe-415 steel. 10

6. Design a short square column to carry an axial load of 1200 kN. Use M-25 concrete mix and Fe-415 steel. 10

7. The plates of a boiler, 6 mm thick, are connected by a single riveted lap joint with 16 mm diameter rivets at 50 mm pitch. Calculate the efficiency of the joint. The allowable stresses are $F_s = 100$ MPa, $F_{br} = 300$ MPa and $F_t = 150$ N/mm² in plates. 10
8. A steel column, 12 m long, carries an axial load of 1000 kN. The column is hinged at both the ends. Design an economical built-up section with double lacing. 10
9. The effective length of compression flange of a simply supported MB 500 @ 0.869 kN/m is 8 m. Determine the safe uniformly distributed load per metre length which can be placed over the beam having an effective span of 8 m. The ends of the beams are restrained against rotation at the bearings.
Take $\sigma_{bc} = 65.121$ N/mm². 10
10. Design a single angle section for a tension member of a roof truss to carry a pull of 100 kN. The member is subjected to possible reversal of stress due to the action of wind. The length of the member from centre to centre of intersection is 3.5 m. 10