

**B.Tech. CIVIL ENGINEERING (BTCLEVI)****Term-End Examination**

June, 2019

00547

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

Time : 3 hours

Maximum Marks : 70

**Note :** Attempt any **five** questions. Use of IS 456 - 2000 and IS 800 - 2007 codes is allowed. Use of scientific calculator is allowed. Steel table is allowed.

1. (a) Prove that the compression in concrete is  $0.36 f_{ck} b x_u$ , where  $b$  is the width of beam and  $x_u$  is limiting depth of neutral axis. 4
- (b) Determine ultimate moment of resistance of a beam shown in Figure 1, with  $A_{st} = 3$  bars of 20 mm diameter,  $f_y = 415$  MPa,  $f_{ck} = 20$  MPa. 10

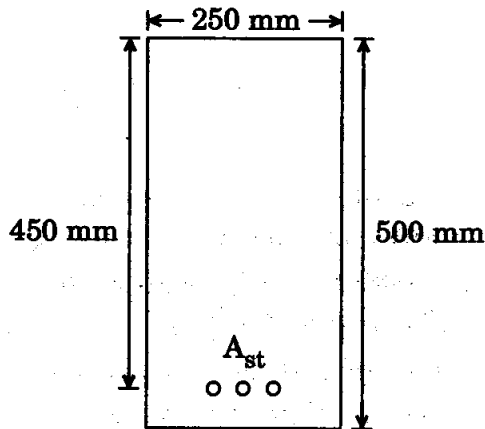


Figure 1

2. Design a floor slab for an interior room with clear dimension of  $3.5 \text{ m} \times 9 \text{ m}$  for a building. The slab is resting on 230 mm thick masonry walls. Assume live load as  $4 \text{ kN/m}^2$  and dead load as  $1.5 \text{ kN/m}^2$ . Use M 20 concrete and Fe 415 steel. 14
3. (a) Design a column of height 3 m which is effectively held in position and restrained against rotation at bottom and effectively restrained against rotation but not held in position at top. It is subjected to axial load of 1650 kN. Use M 25 concrete and Fe 415 steel. 12
- (b) Differentiate between working and limit state method. 2
4. (a) Two plates  $12 \text{ mm} \times 60 \text{ mm}$  are connected in lap joint with 4 bolts of 16 mm diameter having pitch value of 40 mm and edge distance 30 mm. Determine the strength of the joint. Use  $f_{ub} = 400 \text{ MPa}$  and  $f_u = 410 \text{ MPa}$ . 7
- (b) A groove weld is provided to connect two plates of thickness 18 mm and 16 mm. Factored tensile force on joint is 450 kN. The length of weld is 160 mm. Investigate the safety of joint in single V-groove and double V-groove weld. Assume shop welding. 7

5. (a) A 6 m long column is made of a compound section consisting of an ISHB 350 @ 661.2 N/m with a cover plate of 350 mm × 20 mm for each flange. The lower end of the column is restrained against translation and rotation while the upper end is pinned. Determine the design compressive strength of the column. Take  $f_y = 250 \text{ N/mm}^2$ . 10
- (b) What are the advantages of weld connection? 4
6. A steel column ISHB 400 @ 759.3 N/m is subjected to a factored axial load of 200 kN. Design a slab base for the column. Assume that the bearing surfaces of the column and base plate are machined. The concrete footing is of M 20 concrete. 14
7. The section of a welded plate girder consists of flange plates 575 mm × 35 mm and a web plate 1780 mm × 10 mm. Determine the moment capacity of the section and shear resistance corresponding to web buckling. Intermediate stiffeners are not present. 14
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