B.Tech. CIVIL ENGINEERING (BTCLEVI)

Term-End Examination

June, 2017

00084

BICE-013 : STRUCTURAL DESIGN AND DRAWING – I

Time : 3 hours *Maximum Marks : 70*

***Note** : Attempt any **five** questions. All questions carry equal marks. Use of IS 456 and IS 800 codes is permitted. Use of scientific calculator is allowed.*

1. (a) Describe the various assumptions on which the design for the limit state of collapse in flexure is based. *5*

(b) Determine the moment of resistance of a rectangular section b × D = 350 × 500 mm reinforced with 4 ϕ 20. Use M 20 concrete and Fe 415 steel. Assume nominal cover of 20 mm and shear reinforcement of ϕ 8 mm. *9*

2. (a) Sketch the plan and section showing the detailing of reinforcement of a two-way simply supported slab. Also write the important details. *6*

(b) Draw the plans of any four types of staircases with their important details. *8*

3. (a) Differentiate between combined footing and isolated footing. 4

(b) Design longitudinal reinforcement for a circular column of diameter 350 mm with lateral ties for a factored load of 1800 kN and effective length 2·75 m. Take M 20 grade of concrete and Fe 415 grade of steel. 10

4. (a) Describe the assumptions made in the theory of riveted joints. 5

(b) Design the size and length of weld required to develop full strength of the smaller plate shown in Figure 1. Thickness of plates is 16 mm. Take f_y for plate as 250 N/mm^2. 9

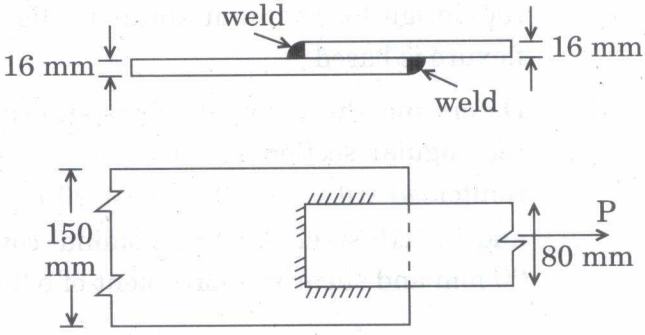

Figure 1

5. (a) Why are lug angles required for the end connection of a tension member ? What are the points to be considered while selecting the lug angle ? 7

(b) Figure 2 shows an ISHB 350 @ 72·4 kg/m with two flange plates 400 mm × 10 mm section each. Find the load carrying capacity of the column if the effective length of the column is 4·5 m (f_y = 250 MPa).

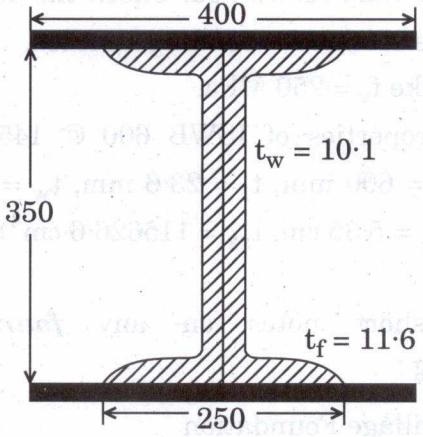

Figure 2

For ISHB 350 @ 72·4 kg/m :

$A = 92{\cdot}21\ cm^2$

$I_{xx} = 19802{\cdot}8\ cm^4$

$I_{yy} = 2510{\cdot}5\ cm^4$ 7

6. (a) Discuss different types of loads that are considered for the design of a roof truss. 8

(b) An ISWB 600 @ 145·1 kg/m section is selected to act as a simply supported beam of 8 m span to carry a uniformly distributed load of 45 kN/m. The compression flange is laterally unsupported but the beam ends are fully restrained. Check the adequacy of the section for bending stresses.
Take f_y = 250 MPa.
(Properties of ISWB 600 @ 145·1 kg/m : D = 600 mm, t_f = 23·6 mm, t_w = 11·8 mm, r_{yy} = 5·35 cm, I_{xx} = 115626·6 cm^4) 6

7. Write short notes on any ***four*** of the following : $4 \times 3\frac{1}{2} = 14$

(a) Grillage Foundation

(b) Development Length

(c) Stress – Strain Curve for Concrete

(d) Euler's Theory of Buckling in Columns

(e) Types of Tension Members

(f) Counterfort Retaining Wall
