C 80766 (Pages : 3) Name.....

Reg. No.....

SIXTH SEMESTER B.TECH. (ENGINEERING) [09 SCHEME] DEGREE EXAMINATION, APRIL 2015

CE/PTCE 09 602—STRUCTURAL DESIGN II

Time : Three Hours Maximum : 70 Marks

(Use of IS 800, IS 883, IS 875, SP6 *and steel table are permitted*)

(*Assume suitable data if not given*)

Part A

Answer **all** *questions.*

1. Define Shape factor and Load factor.
2. How are steel sections classified as per IS 800 : 2007.
3. Define web buckling in beams.
4. Define Slab base with a neat sketch.
5. Explain filched beam with neat sketch.

(5 × 2 = 10 marks)

Part B

Answer any **four** *questions.*

6. Calculate the collapse load for a propped cantilever beam of span 'L' subjected to uniformly distributed load of intensity '*w*' kN/m. Plastic moment capacity of cross section of beam is M_p.
7. Design a single bolted cover joint butt joint to connect boiler plates of thickness 12 mm. for maximum efficiency. Use M 20 blots of grade 4.6. Boiler plates are of Fe 410 grade. Find the efficiency of joint.
8. In a truss, a strut 3.2 m. long consists of two angles ISA 90 mm. × 90 mm. × 6 mm. Find the strength of the member if the angles are connected on both sides of 12 mm. gusset plate by two bolts.
9. Determine the design bending strength of ISLB 350 at 486 N/m, considering the beam to be laterally supported. Assume the design force is less than the design strength. The unsupported length of beam is 3 m. Use steel of grade Fe 410.

Turn over

10. Design a slab base for a column ISHB 300 at 577 N/m carrying an axial factored load of 1000 kN. M 20 concrete is used for the foundation.

11. A flitched beam consists of a wooden joist 150 mm. wide and 250 mm. deep strengthened by a steel plate 10 mm. thick and 200 mm. deep one on either side of the joist. If the stresses in wood and steel are not to exceed 7 N/mm^2 and 120 N/mm^2, find the moment of resistance of section of beam. Take $E_s = 20\ E_w$.

(4 × 5 = 20 marks)

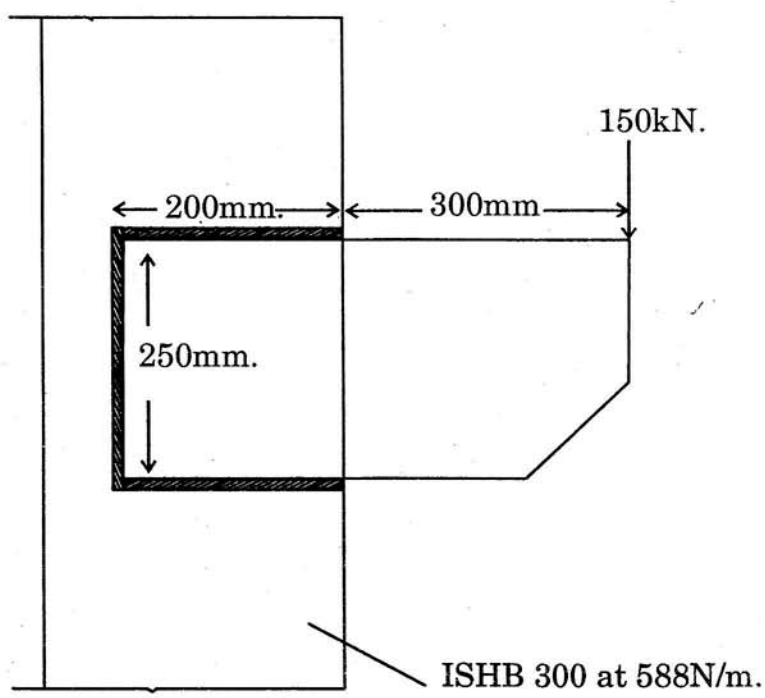
Part C

Answer **all** *questions.*

12. (a) Two ISF sections 200 mm × 10 mm. each and 1.5 m. long are to be jointed to make a member of length 3 m. Design a butt joint with the bolts arranged in diamond pattern and find the efficiency. The flats are supposed to carry a factored tensile force of 500 kN Steel is of grade Fe 410. 20 mm. diameter bolts of grade 4.6 are used to make the connections.

Or

(b) A bracket plate is shop welded to flange of a column as in fig. Design the connection. Steel is of grade Fe 410.



13. (a) Design a built up column consisting of two channels placed toe to toe. The column carries an axial factored load of 1600 kN. The effective height of the column is 8 m. Design built up column using double lacing system using grade 4.6, M 20 bolts. Use Fe 410 grade steel.

Or

(b) Design a simply supported laterally restrained beam of span 5 m. subjected to u.d.l. of 10 kN/m, using Fe 410 grade steel.

14. (a) A column ISHB 350 at 661.2 N/m. carries an axial compressive load of 1700 kN. Design a suitable welded gusset base. The base rests on M 20 grade of concrete.

Or

(b) Design channel section purlin for the following data: Distance between c/c of trusses- 5 m, Distance between c/c of purlins- 1.6 m. Inclination of the roof surface to horizontal 30°, Weight of GI sheets 135 N/m^2, Wind load normal to roof- 1.5 kN/m^2. Use steel of grade Fe 410.

15. (a) Design a solid wood column for the following requirements: Load on the column - 450 kN, safe stress - 7N/mm^2, Effective length of column - 3 m. Assume column situated at outside location.

Or

(b) A timber beam 150 mm. wide and 200 mm. deep is to be reinforced by bolting on two steel flitches each of 150 mm × 12.5 mm in section. Find the moment of resistance when (i). The flitches are attached symmetrically at top and bottom. (ii). The flitches are attached symmetrically at sides. Allowable stress in timber is 6 N/mm^2. What is the maximum stress in steel in each case. Take $E_s = 20\ E_w$.

(4 × 10 = 40 marks)