SIXTH SEMESTER B.TECH. (ENGINEERING) DEGREE EXAMINATION
JUNE 2009

CE 04 603—STRUCTURAL DESIGN—I
(2004 admissions)

Time : Three Hours
Maximum : 100 Marks

All designs shall be done as per IS specification.
S.I. unit shall be followed.
Use of IS : 800, IS : 883, IS : 875 and SP 6 shall be permitted in the examination hall.

I. (a) What do you mean by a single and double angle ties.
(b) State the advantages of welded connections.
(c) What are the design criteria for a laterally unrestrained compound beams.
(d) What is the purpose of providing battery.
(e) What is a moment resisting connection? Explain the concept.
(f) What are the factors to be taken care while designing purlins?
(g) Write the design procedure for composite beam section with timber and steel.
(h) Name the different types of roof trusses.

(8 x 5 = 40 marks)

II. (a) A double riveted double cover butt joint is used to connect plates 12 mm thick. Determine diameter of rivet value, gauge and efficiency joint. Add the following stresses:
Working stress in shear in power driven rivets = 100 MPa, working stress in bearing in power driven rivets = 300 MPa. For plates working stress in axial tension is 0.6 $f_y$, where $f_y = 275$ N/mm$^2$.

(15 marks)

Or

(b) (i) Distinguish between rigid and semi-rigid analysis.
(ii) Mention the steps involved in design of high strength friction grip bolts.

(7 marks)

(8 marks)

III. (a) A steel column 10 m long carries an axial load of 900 kN. Column is hinged at both ends. Design an economical built up section with double lacing. Design the lacing also.

Or

(b) ISMB 550 at 1.037 kN/m has been used as simply supported beam over a span of 4m. Ends of the beam are restrained against torsion but not against lateral bending. Determine safe u.d.l. which the beam can carry.

(15 marks)

Turn over
IV. (a) A column section ISHB 300 at 0.63 kN/m with one cover plate 500 x 25 mm either side is carrying an axial load of 3000 kN inclusive of self weight of base and column. Design a suggested base. The allowable bending pressure in concrete is 4 N/mm$^2$. The allowable bending stress in base plate is 185 N/mm$^2$.

Or

(b) Design an angle iron purlin for a trussed roof from the following data:

- Span of roof truss = 1.3 m
- Spacing of root truss = 5.5 m
- Spacing of purlins along slope of roof truss = 2 m
- Slope of roof truss = 1 vertical to 2.5 horizontal
- Wind load on roof normal to roof = 1150 N/m$^2$
- Vertical load from roof sheeting etc = 200 N/m$^2$.

(15 marks)

V. (a) A sal wood beam carries u.d.l. of 0.8 kN/m inclusive of self weight of the beam. The beam is simply supported at both ends. The clear span of the beam is 7m. Design the timber beam.

Or

(b) A beam is simply supported to its both end. The effective span is 5.5 m. It consists of 300 mm x 350 mm Rose wood with 300 mm x 15 mm steel plates to its side as shown in the below figure. Determine safe u.d.l. beam with support.

(15 marks)

(4 x 15 = 60 marks)