Diploma in Civil Engineering

Term-End Examination

December, 2006

BCE-032 : THEORY OF STRUCTURES-I

Time : 2 hours *Maximum Marks : 70*

Note : *Question no. 1 is **compulsory**. Attempt any **four** questions from the remaining. Total number of questions to be attempted are five. Assume suitable data wherever necessary and mention it clearly. Use of calculator and steel tables is permitted.*

1. Choose the most appropriate answer from the given alternatives : *7×2=14*

(i) The maximum longitudinal pitch admissible in riveted tension member joint is

(a) 300 mm

(b) 200 mm

(c) 30 times the thickness of the plate

(d) 10 times the diameter of the rivet

(ii) The diameter of a rivet during riveting increases by

(a) 1·5 to 2 mm

(b) no increase at all

(c) 0 to 1·5 mm

(d) ten percent of the rivet diameter

(iii) The permissible minimum distance of a sheared edge of plate from the centre of the rivet in riveted connection is about

(a) 4 times the diameter of the rivet

(b) 1·75 times the diameter of the rivet

(c) 6·75 times the diameter of the rivet

(d) the diameter of the rivet

(iv) The weakest section in computation of strength in a fillet weld is

(a) side parallel to the load axis

(b) side perpendicular to the load axis

(c) throat of the fillet

(d) None of the above

(v) The maximum slenderness ratio permissible in steel ties which may be subjected to compression under wind load conditions should be

(a) 250

(b) 350

(c) 450

(d) No limit

(vi) The effective area of a welded rolled angle for the design purpose as a compression member is equal to

(a) gross area

(b) full area of welded leg

(c) full area of welded leg plus 50% of the outstanding leg

(d) 50% of the total area of angle

(vii) The effective length of a steel column hinged at one end and fixed at the other end, as per codal provisions, is equal to

(a) 0·65 × distance between supports

(b) 0·80 × distance between supports

(c) distance between supports

(d) 2·0 × distance between supports

2. A beam ABC is loaded as shown in Figure 1. Analyse the beam to determine the support moments and reactions. Moment of inertia of both the spans is same. Draw B.M. and S.F. diagrams also. *14*

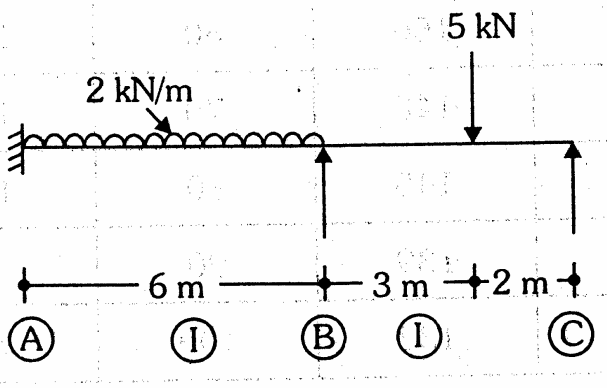

Figure 1

3. Design a simply supported beam of 6·0 m effective span carrying UDL of 50 kN/m. The compression flange is laterally supported throughout. Use steel of f_y = 250 MPa. *14*

4. (a) A beam has a span of 20 m. Draw influence line diagrams for bending moment and shear force at a point 'A', 7 m from the left hand support. *7*

(b) Calculate maximum negative and positive SF at 'A' of the above beam, when two connected wheel loads 9 kN and 6 kN at a fixed distance of 1·5 m rolls from left to right. The 6 kN load leads while rolling. *7*

5. A steel strut consisting of double angles placed back to back on the opposite side of 10 mm gusset plate has an effective length of 2·5 m. Design the strut to carry a compressive load of 300 kN using steel of f_y = 250 N/mm^2. Take appropriate value of allowable axial compression σ_{ac} from following table. *14*

l/r	σ_{ac}	*l/r*	σ_{ac}
10	150	60	122
20	148	70	112
30	145	80	101
40	139	90	90
50	132	100	80

6. A double angle tie of ISA 125 mm × 95 mm × 10 mm, placed short leg back to back, is connected to the same side of gusset plate of 10 mm thickness using 20 mm rivet. Calculate the tensile load this member can carry if the angles are properly tacked together. Use steel of $f_y = 250\ N/mm^2$. *14*

7. A propped cantilever shown in the figure carries the loads as shown. Determine the support reactions and also draw the SF and BM diagrams. *14*

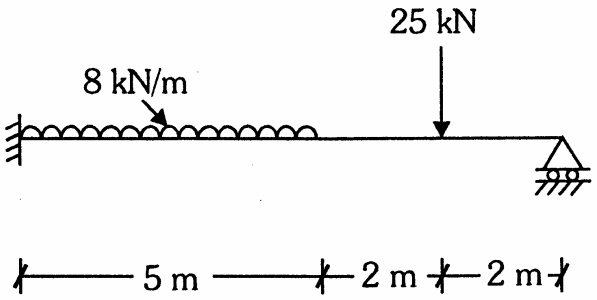

Figure 2

8. Two ISA 90 mm × 60 mm × 10 mm angles form a tie member of a truss and are subjected to a load of 250 kN. These angles are connected to both sides of a 10 mm gusset plate. Design the welded connection using only side fillets. *14*