BCE-032

Diploma in Civil Engineering

Term-End Examination

June, 2011

BCE-032 : THEORY OF STRUCTURES-I

ıe : 2 hours *Maximum Marks : 70*

te : *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. Use of calculator and steel tables is permitted.*

Choose the most appropriate answer from the following alternatives in each case. **7x2=14**

(a) The maximum pitch in the direction of the stress in a rivetted joint in tension is :

(i) 2.5 d

(ii) 16t or 200 mm whichever is less

(iii) 4t + 100 mm

(iv) 12t or 200 mm whichever is less

(b) The cross sectional area of a rivet jointed compression member is given by its :

(i) Net area

(ii) Net effective area

(iii) gross area

(iv) gross area minus the area of rivet holes.

(c) The throat thickness in a fillet weld is :

(i) perpendicular distance from the root to the hypotenuse.

(ii) longer side of the triangle of fillet.

(iii) shorter side of the triangle of fillet.

(iv) The length of the hypotenuse of the triangle of the fillet.

(d) The maximum admissible slenderness ratio for tension members (other than pretensioned ones) is :

(i) 350 (ii) 400

(iii) 250 (iv) 300

(e) A built up tension member composed of two flats, angles or tees tacking rivets are provided at pitch in line not exceeding :

(i) 2000 mm (ii) 1800 mm

(iii) 1500 mm (iv) 1000 mm

(f) Lacings or battens in a built up steel column are mainly provided :

(i) to prevent the buckling of the column

(ii) to decrease the buckling of the column

(iii) to increase the capacity of the column

(iv) to ensure the unified behaviour of the built up column.

(g) A structural member subjected to compressive stress in a direction parallel to its longitudinal axis is generally known as :

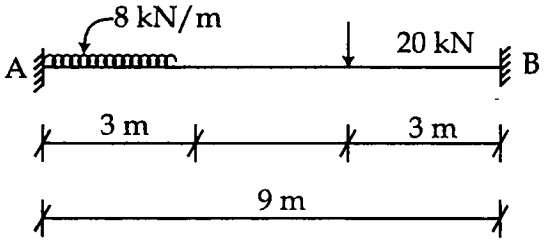
(i) Column (ii) Strut

(iii) Stanchion (iv) All the above

2. (a) A simply supported beam has a span of 20 m. Draw the influence line diagrams for shear force and bending moment for a section 'X', which is 7 m from the left hand support. 7

(b) Calculate the maximum negative and positive shear force at 'X' of the above beam when two connected wheel loads of 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

3. A beam AB of span 9 m is fixed at both ends A and B and is loaded as shown in the figure. Determine the fixed end moments and the support reactions. Draw the bending moment and shear force diagrams. 14



4. (a) A 6 mm thick angle section is joined to a 10 mm thick gusset plate by means of 16 mm diameter hand driven field rivets. The angle is subjected to a tensile force of 55 kN. Find the number of rivets required for the joint. The permissible stresses in hand driven field rivets are 72 N/mm^2 and 225 N/mm^2 in shearing and bearing respectively. 10

(b) Explain the various types of rivets used in steel structures. 4

5. An ISA $100 \times 100 \times 6$ ($fy = 250\ N/mm^2$) is used as a strut in a truss. The length of the strut between intersections is 3.0 m. Calculate the strength of the strut if :

(a) It is connected by one rivet at each end. 5

(b) It is connected by two rivets at each end. 5

(c) It is welded at each end. 4

6. (a) Explain the procedure for the design of angle iron purlins of a roof truss. 7

(b) Explain the procedure for checking the stability of a masonary dam. 7

7. Design a simply supported I-section beam of 8 m span carrying a udl of 48 kN/m over its entire length. The compression flange may be assumed laterally supported throughout its length. (fy = 250 MPa). 14

8. Write short notes on *any four* of the following : 4x3½=14

(a) Strength and Efficiency of a rivetted joint.

(b) Stiffness of a beam and distribution factors in moment distribution method.

(c) Web buckling of I-section beam.

(d) Advantages and disadvantages of welding.

(e) Size and types of butt welds.

(f) Various types of roof trusses.

(g) Minimum depth of foundations.

(h) Various sections used as struts in roof trusses.