Diploma in Civil Engineering

Term-End Examination

June, 2010

00342

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 following alternatives in each case. **7x2=14**

    (a) A pin-jointed plane frame is unstable if :

    (i) $(m+r) < 2J$

    (ii) $m+2 = 2J$

    (iii) $(m+r) > 2J$

    (iv) none of the above

    Where m is number of member, r is reaction components and J is number of joints.

(b) The moment required to rotate the near end of a prismatic beam through a unit angle without translation, the far end being simply supported, is given by :

(i) $\dfrac{3\,EI}{L}$ (ii) $\dfrac{4\,EI}{L}$

(iii) $\dfrac{2\,EI}{L}$ (iv) $\dfrac{EI}{L}$

(c) Minimum pitch of the rivets should not be less than :

(i) 1.5 d

(ii) 2.0 d

(iii) 2.5 d

(iv) 3.0 d

Where d is gross diameter of rivet.

(d) According to IS specifications, the maximum pitch of rivets in compression is :

(i) lesser of 200 mm and 12 t

(ii) lesser of 200 mm and 16 t

(iii) lesser of 300 mm and 32 t

(iv) lesser of 300 mm and 24 t

Where t is thickness of thinness outside plate or angle.

(e) The maximum slenderness ratio of a compression member carrying both dead and superimposed loads is :

(i) 180

(ii) 200

(iii) 250

(iv) 350

(f) Which of the following sections will have the largest shape factor for a given area ?

(i) rectangular section

(ii) I - section

(iii) solid circular section

(iv) diamond section

(g) Intermediate vertical stiffeners are provided in plate girder to :

(i) eliminate web buckling

(ii) eliminate local buckling

(iii) transfer concentrated loads

(iv) prevent excessive deflection

2. For a simply supported beam, shown in **14** figure - 1, construct the influence line diagram for reaction at A (R_A), shear at X (F_X) and bending moment at X (M_x). Calculate maximum values of R_A, F_X and M_x due to :

(a) Four concentrated moving loads, as shown in figure - 1 and by

(b) A moving uniformly distributed load of 12 kN/m longer than the span.

Figure 1

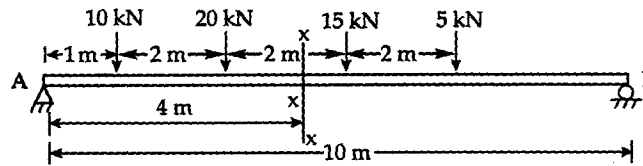3. Determine the deflection at point B and C of the beam shown in figure - 2. **14**

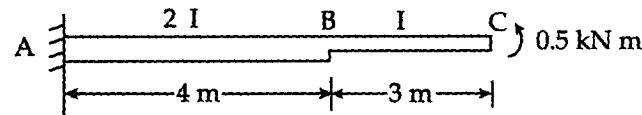Take $E = 210$ GPa, $I = 8 \times 10^6$ mm^4

Figure 2

4. Determine the end slope and mid span deflection of a simply supported beam carrying a udl w over span L shown in figure - 3. **14**
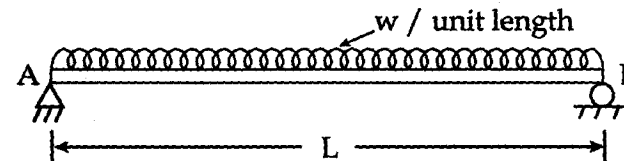

Figure 3

5. Determine the strength (per mm length of weld) of a butt - welded joint in tension. Where two 16 mm thick plates are joined by : **14**

   (a) A double - V butt weld, and

   (b) A single - V butt weld

   Take maximum permissible stress as 142 N/mm^2 in both cases.

6. Write the procedure of designing single angle struts. **14**

7. What are various loads considered in the design of a truss ? Enlist them and explain how these are estimated. **14**

8. Write short notes on *any four* of the following :

   4x3½=14

   (a) Calculation of pressures at the base of a retaining wall

   (b) Assumptions for the design of riveted joints

   (c) Effective length of compression member

   (d) Tubular column

   (e) Advantages and disadvantages of welding

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