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BCE-032(S)

DIPLOMA IN CIVIL ENGINEERING DCLE (G) / ADVANCED LEVEL CERTIFICATE COURSE IN CIVIL ENGINEERING (DCLEVI/ACCLEVI)

Term-End Examination

00138

December, 2016

BCE-032(S) : THEORY OF STRUCTURES – I

Time : 2 hours *Maximum Marks : 70*

Note : *Question number 1 is* ***compulsory****. Attempt any* ***four*** *questions from the remaining. In total,* ***five*** *questions are to be attempted. Assume suitable data wherever necessary. Use of calculator is permitted.*

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

(a) If the nominal diameter of a rivet is 27 mm, then the gross diameter of the rivet hole will be

(i) 27 mm

(ii) 28·5 mm

(iii) 25 mm

(iv) 29 mm

(b) The slope and deflection at various points in a beam subjected to bending moment are

(i) independent functions

(ii) directly proportional to bending moment

(iii) interdependent functions

(iv) None of the above

(c) The maximum permissible eccentricity of load for no tension at the base of a masonry wall having a base width 'B' is

(i) $\frac{B}{6}$

(ii) $\frac{B}{3}$

(iii) $\frac{B}{4}$

(iv) $\frac{B}{2}$

(d) The strength of a riveted joint is equal to the

(i) shearing strength of the rivets

(ii) bearing strength of the rivets

(iii) tearing strength of plate

(iv) Least of (i), (ii) and (iii)

(e) The pitch of a roof truss is given by

(i) $\frac{\text{Rise}}{\text{Span}}$

(ii) $\frac{\text{Span}}{\text{Rise}}$

(iii) $\frac{2 \times \text{Rise}}{\text{Span}}$

(iv) $\frac{\text{Rise}}{2 \times \text{Span}}$

(f) When two plates are placed end to end and are joined using a cover plate on one side, the joint is known as

(i) Lap joint

(ii) Flap joint

(iii) Single cover butt joint

(iv) Double cover butt joint

(g) The maximum bending moment in a purlin of a roof truss may be taken as

(i) $\frac{WL}{12}$

(ii) $\frac{WL}{10}$

(iii) $\frac{WL}{8}$

(iv) $\frac{WL}{6}$

2. Draw the influence line diagram for bending moment at point P of the simply supported beam AB as shown in Figure 1. Using this diagram, find the maximum bending moment at P due to two connected wheel loads of 10 kN each, 3 m apart and moving from A to B. *14*

Figure 1

3. (a) State the two Moment-Area theorems. *6*

(b) A fixed beam AB of span 10 m carries a point load of 10 kN at 3 m from the end B. Using Moment-Area theorem, analyse the beam and draw the shear force and bending moment diagrams. *8*

4. Using moment distribution method, analyse the portal frame shown in Figure 2 and draw the bending moment diagram. The moments of inertia are shown within circles. *14*

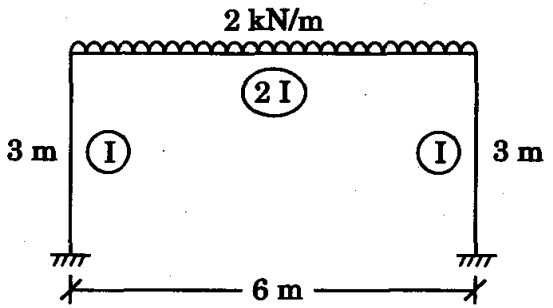

Figure 2

5. (a) Describe the assumptions made in the design of riveted joints. *6*

(b) Design a riveted connection for an angle ISA 60 × 40 × 6, connected by the longer leg to a gusset plate 6 mm thick using 16 mm dia power-driven shop rivets and carrying a tensile force of 45 kN. Maximum permissible stresses in the power-driven shop rivets are : *8*

Shear (τ_{vf}) = 100 MPa

Bearing on rivet (σ_{pt}) = 300 MPa

6. A column is made up of an ISHB 350 @ 72·4 kg/m with two flange plates 400 × 10 mm section each, as shown in Figure 3. Find the total load carrying capacity of the column, if the effective length of the column is 4·5 m. Take f_y = 250 MPa. *14*

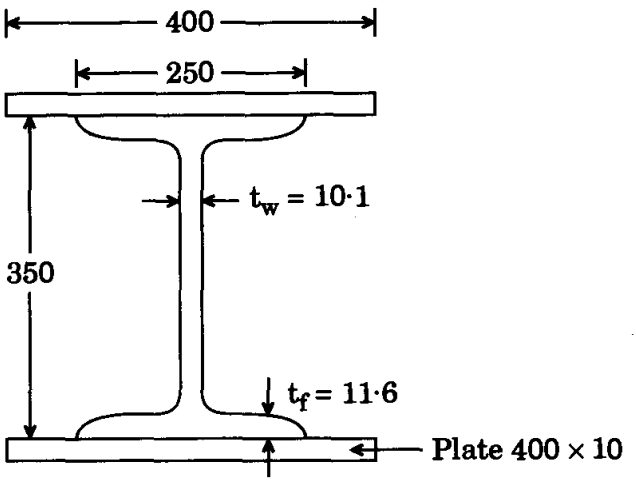

Figure 3

Properties of ISHB 350 :

$A = 92{\cdot}21\ cm^2$

$I_{xx} = 19802{\cdot}8\ cm^4$

$I_{yy} = 2510{\cdot}5\ cm^4$

For f_y = 250 MPa :

λ	40	50	60
σ_{ac} (MPa)	139	132	122

7. (a) Describe the two stability criteria of retaining walls. 7

(b) Describe different types of loads that are considered for the design of a roof truss. 7