DIPLOMA IN CIVIL ENGINEERING DCLE (G) /

ADVANCED LEVEL CERTIFICATE COURSE IN

CIVIL ENGINEERING (DCLEVI/ACCLEVI)

Term-End Examination

01385

December, 2014

BCE-032 : THEORY OF STRUCTURES – I

Time : 2 hours   *Maximum Marks : 70*

Note : *Question number 1 is **compulsory**. Attempt **four** questions from the remaining questions. Use of scientific calculator is permitted. Assume missing data if any, suitably.*

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

    (a) The slope and deflection at various points in a beam subjected to Bending Moment are :

        (i)   Independent functions

        (ii) Interdependent functions

        (iii) Directly proportional to BM

        (iv) None of the above

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

(i) $\dfrac{B}{2}$

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

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

(iv) $\dfrac{B}{6}$

(c) According to IS code, the maximum pitch of rivets in compression flange is
   (i) lesser of 250 mm and 16 t
   (ii) lesser of 200 mm and 12 t
   (iii) lesser of 250 mm and 12 t
   (iv) lesser of 200 mm and 16 t

(d) The strength of a rivetted joint is equal to
   (i) Tearing strength of the plates
   (ii) Bearing strength of the rivets
   (iii) Shearing strength of the rivets
   (iv) Least of (i), (ii) and (iii)

(e) In a steel beam the calculation of tensile and compressive stresses respectively in bending is based on
   (i) gross area and net area
   (ii) net area and gross area
   (iii) net area in both cases
   (iv) gross area in both cases

(f) The effective length of a column having unsupported length 'L' and one end fixed and other end free is given by

(i) 0·65 L

(ii) 0·50 L

(iii) 1·2 L

(iv) 1·5 L

(g) The size of a butt weld is denoted by its effective throat thickness but in case of incomplete penetration, the effective throat thickness is taken as :

(i) Half the thickness of the thicker part connected

(ii) Five-eighth (5/8) thickness of the thinner part

(iii) Half the thickness of thinner part connected.

(iv) Nome of the above

2. A continuous beam is loaded as shown in Figure 1. Calculate support reaction and draw B.M.D. and S.F.D using Three Moments Theorem. Assume EI as constant. *14*
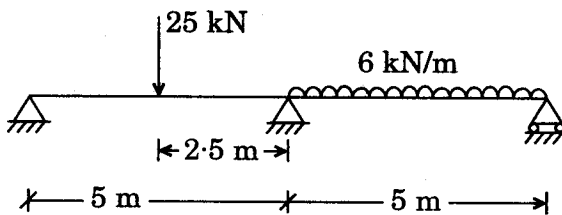

Figure 1

3. A portal frame is loaded as shown in Figure 2. Analyse the portal frame and draw B.M. and S.F. diagrams. Assume moment of inertia as shown within circle. *14*
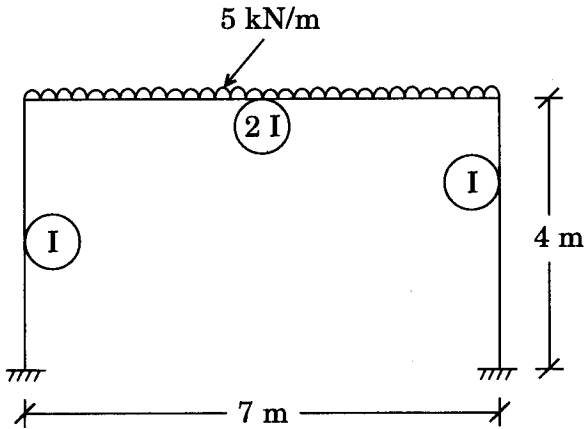
5 kN/m

4 m

7 m

Figure 2

4. Design a simply supported steel beam using I section. Effective span of the beam is 7 m and it carries a UDL of 50 kN/m. The compression flange may be assumed laterally supported throughout its length and $F_y = 250$ N/mm^2. *14*

5. Write short notes on any *four* of the following : $4 \times 3\frac{1}{2} = 14$

   (i)   Euler's formula for critical load
   (ii)   Lug Angles
   (iii) Grillage Base
   (iv) Tacking Rivet
   (v)   Lacing in compound columns
   (vi) Local buckling
   (vii) Advantages of welding joints

6. What are various types of loads considered in the design of trusses ? Write various steps in the design of purlins. *14*

7. Calculate the safe load a column can carry with an effective length 5 m. The section of column is as shown in Figure 3.
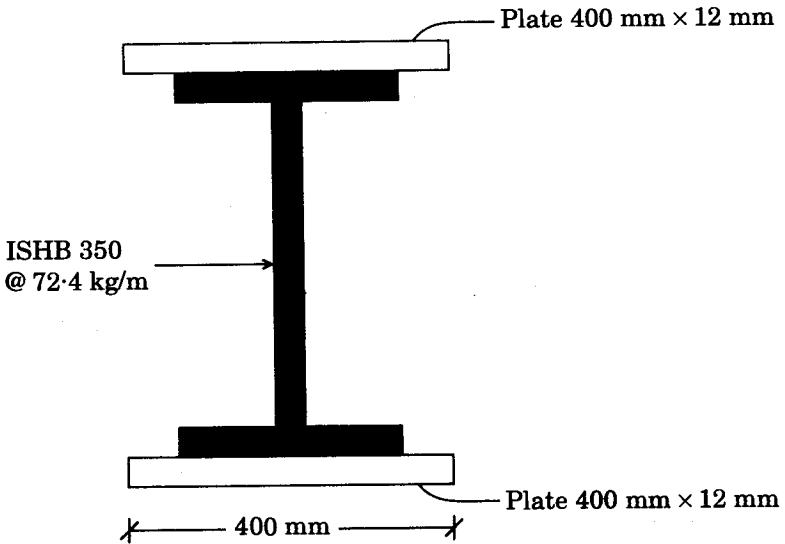

Figure 3

Value of allowable axial compression σ_{ac} for various slenderness ratios are as below : *14*

l/r min	10	20	30	40	50	60	70	80	90
σ_{ac} (N/mm^2)	150	148	145	139	132	122	112	101	90

8. A tension member consists of two $100 \times 75 \times 10$ mm IS angles. These angles are connected by their long legs to a gusset plate by means of 18 mm diameter rivets in such a way that each angle section is reduced by one rivet only. Calculate the tensile strength of the member :   *14*

    (a) The angles are connected on the same side of a gusset plate 12 mm thickness and angles are properly tack riveted.

    (b) The angles are connected on the opposite sides of a 12 mm gusset plate and angles are properly tack riveted.

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