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No. of Printed Pages : 5

BCE-032

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

Term-End Examination

December, 2015

BCE-032 : THEORY OF STRUCTURES – I

Time : 2 hours *Maximum Marks : 70*

Note : *Question number **1** is **compulsory**. Attempt any **four** questions from the remaining questions. Total number of questions to be attempted are **five**. Assume suitable data wherever necessary and mention it clearly. Use of steel tables and calculator is permitted.*

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

(a) The permissible maximum pitch in a riveted joint in compression is

(i) 2·5 d

(ii) 16 t or 200 mm whichever is less

(iii) 12 t or 200 mm whichever is less

(iv) 4 t + 100 mm

(b) The strength of a riveted joint is equal to

(i) Shearing strength of rivet

(ii) Bearing strength of rivet

(iii) Tearing strength of the plate

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

(c) The minimum size of the fillet weld is

(i) 1 mm

(ii) 2 mm

(iii) 3 mm

(iv) 5 mm

(d) The effective length of a fillet weld is taken as

(i) $l - 4s$

(ii) $l - 2s$

(iii) $0{\cdot}8\,l$

(iv) $0{\cdot}9\,l$

where 'l' and 's' are the actual length and size of the weld respectively.

(e) The maximum permissible slenderness ratio of steel compression member is

(i) 180

(ii) 250

(iii) 350

(iv) 400

(f) In a tension member composed of two angles, flats or tees, tacking rivets are provided at a pitch in line not exceeding

(i) 2000 mm

(ii) 1800 mm

(iii) 1500 mm

(iv) 1000 mm

(g) The effective length of a compression member effectively held in position and restrained against rotation at one end and at the other end restrained against rotation but not held in position is

(i) 1·5 L

(ii) 2·0 L

(iii) 1·2 L

(iv) 0·65 L

2. A fixed beam AB of span l is loaded with a udl of w kN/m throughout its length. Analyse the beam using moment area method and calculate the fixed end moments. Draw the shear force and bending moment diagrams for the beam. *14*

3. Analyse the prismatic continuous beam ABC shown below (Figure 1). Draw the bending moment and shear force diagrams. *14*

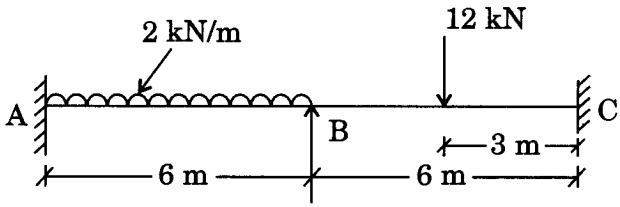

Figure 1

4. (a) Calculate the value of a 30 mm dia rivet in a lap joint connecting plates of thickness 20 mm and 25 mm. Permissible shearing and bearing stresses in the rivet are 100 N/mm^2 and 300 N/mm^2 respectively. *7*

(b) Design a suitable fillet welded joint between two plates of size 180 mm × 8 mm and 200 mm × 8 mm to develop the full strength of the smaller plate in tension. Assume permissible tensile stress in plate and shearing stress in the fillet weld as 150 N/mm^2 and 108 N/mm^2 respectively. *7*

5. (a) A beam AB of span 12 m is simply supported. Draw the influence line diagrams for shear force and bending moments for a section 'P' which is at a distance of 4 m from the left hand support. *7*

(b) Using the influence line diagrams drawn above in question 5 (a), calculate the maximum bending moment at P when a udl of 4 kN/m of length 3 m crosses the beam from left to right. 7

6. Determine the strength of a single angle discontinuous strut 60 × 40 × 6 of a roof truss. Centre to centre of the intersection is 1·4 m.

(a) When the strut is connected by a single rivet at the ends.

(b) When the strut is connected by two or more rivets at the ends. $2 \times 7 = 14$

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

(a) Types of welded joints

(b) Net effective area of tension members

(c) Statically determinate and indeterminate structures

(d) Lug angles

(e) Safety of masonry dams

(f) Carry over moments

Slenderness Ratio = λ	140	150	160	170
Permissible Stress σ_{ac} N/mm^2	51	45	41	37