No. of Printed Pages : 7

BCE-032

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

Term-End Examination

June, 2018

00023

BCE-032 : THEORY OF STRUCTURES – I

Time : 2 hours *Maximum Marks : 70*

Note : *Attempt any **five** questions including question number **1** which is **compulsory**. Assume suitable data, if missing, and mention it clearly. Use of calculator is permitted.*

1. Choose the correct answer from the given options for (a) to (g) : *7×2=14*

(a) For the two concentrated loads (fixed base) moving on a simply supported beam AB as shown in Figure 1, which condition will give the maximum bending moment at 'C' ?

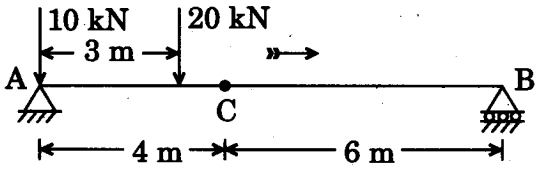


Figure 1

(i) When 10 kN load at C

(ii) When 20 kN load at C

(iii) When 20 kN load at B

(iv) When 10 kN load at A

(b) For the fixed beam AB, subjected to a point load 'P' at C (as shown in Figure 2), the correct BMD is

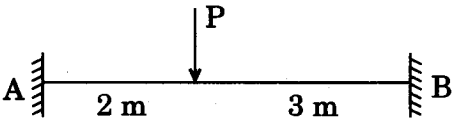
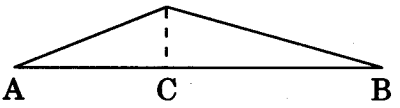
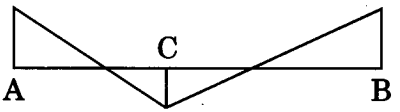


Figure 2

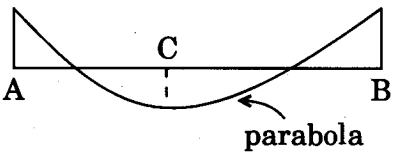
(i)



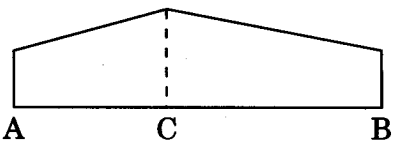
(ii)



(iii)



(iv)



(c) The absolute stiffness of a prismatic member with far end being freely supported is given by : (EI is constant)

(i) $\frac{4\,EI}{L}$

(ii) $\frac{EI}{L}$

(iii) $\frac{3\,EI}{L}$

(iv) $\frac{3}{4}\frac{EI}{L}$

(d) The fixed end moment at 'A' of fixed beam AB subjected to point load at C (as shown in Figure 3) is given by

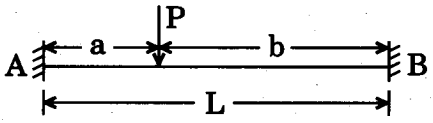


Figure 3

(i) $\frac{Pab}{L}$

(ii) $\frac{Pa^2b}{L^2}$

(iii) $\frac{Pab^2}{L^2}$

(iv) $\frac{PL}{8}$

(e) In the butt weld shown in Figure 4, the throat thickness is given by

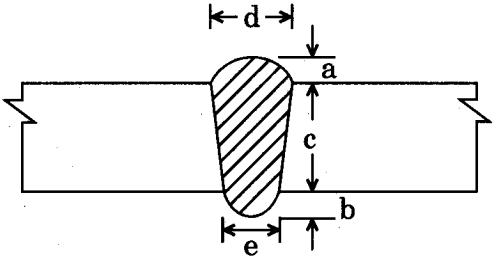


Figure 4

(i) a + b + c

(ii) c

(iii) a + c

(iv) c + b

(f) The "middle third rule" in case of dams ensures the following condition :

(i) No overturning of dam

(ii) No sliding of dam

(iii) No tension in the section

(iv) No compression in the section

(g) In the compound column with lacing, the inclination of lacing bars

(i) $\lessdot 40°$

(ii) $\gtrdot 70°$

(iii) None of the above

(iv) Both (i) and (ii) above are correct

2. (a) Draw the influence line diagram for shear force and bending moment at a section 5 m from the left hand support of a simply supported beam of 20 mm effective span. *4+4*

(b) For the above beam, calculate the maximum bending moment at the section 5 m from the left hand, due to a uniformly distributed rolling load of length 8 m and intensity 10 kN/m run. Give a neat sketch, showing the position of rolling load. *4+2*

3. (a) With the help of neat typical sketch write the first moment area theorem and second moment area theorem. *3+3*

(b) Using slope deflection method, draw BMD and SFD for the beam shown in Figure 5. *8*

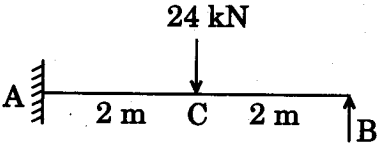


Figure 5

4. Analyse the portal frame shown in Figure 6 using moment distribution method. Draw BMD. Consider EI as constant. Also determine the horizontal thrust at both the hinges. *14*

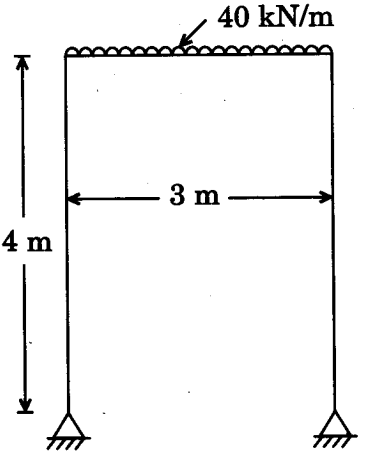


Figure 6

5. (a) Discuss the assumptions in the theory of riveted joints. *7*

   (b) Discuss the advantages and disadvantages of using welded joints. *7*

6. Determine the allowable axial load carrying capacity of a single angle strut of ISA 100 × 100 × 8. The effective length of strut is 2·5 m. Use steel with f_y = 250 MPa and allowable compressive stresses from the table given below : *14*

l/r	90	100	110	120	130
σ_{ac} (N/mm^2)	90	80	72	64	57

For ISA 100 × 100 × 8,

A = 15·4 cm^2 and r_{min} = 1·94 cm.

7. A masonry dam is 30 m high, 5·1 m wide at the top and 17 m wide at the base. The depth of water retained behind the vertical face of the dam is 29 m. Determine the maximum and minimum stress intensities at the base. The weight of water is 10000 N/m^3 and weight of masonry is 22000 N/m^3. Give a neat sketch of the problem. *10+4*

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

(a) Properties of influence lines

(b) Stability of dams against overturning

(c) Lug Angles

(d) Types of welded joints

(e) Bi-axial bending of beams

(f) Euler's theory of buckling