No. of Printed Pages : 7

BCE-032

Diploma in Civil Engineering DCLE(G)
Advanced Level Certificate Course in Civil Engineering
DCLEVI/ACCLEVI

00163

Term-End Examination

December, 2012

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 table is permitted.*

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1. Choose the most appropriate answer from the following alternatives in each case : **7x2=14**

(a) If the nominal diameter of a rivet is 20 mm, then gross diameter of the rivet hole will be :

(i) 21.5 mm (ii) 21 mm

(iii) 22 mm (iv) 22.5 mm

(b) A simply supported beam has :

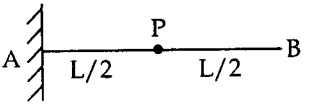
(i) both ends hinged

(ii) both ends roller supported

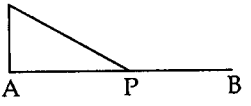
(iii) one end hinged and other roller supported

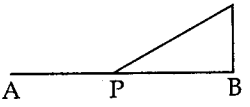
(iv) one end fixed and other end free.

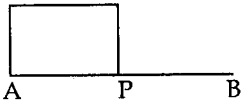
(c) The influence line diagram for bending moment at 'P' in the beam shown in Figure 1, is :

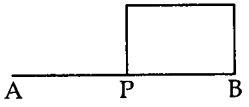


(Fig. 1)

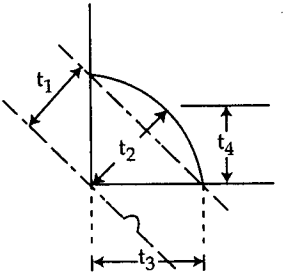
(i) 

(ii) 

(iii) 

(iv) 

(d) In the fillet weld shown in Figure 2, the size of weld is :



(Fig. 2)

(i) t_1 (ii) t_2 (iii) t_3 (iv) t_4

(e) The effective length of a column having unsupported length = L and fixed at base and free at other end, is given by :

(i) 1.00 L (ii) 1.2 L

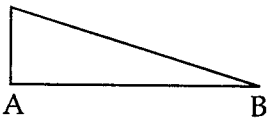
(iii) 1.5 L (iv) 2.00 L

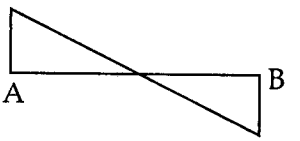
(f) Pitch of a roof truss is given by :

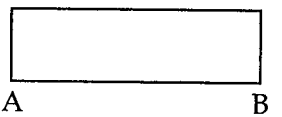
(i) $\frac{\text{Rise}}{\text{Span}}$ (ii) $\frac{\text{Span}}{\text{Rise}}$

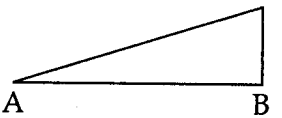
(iii) $\frac{2 * \text{Rise}}{\text{Span}}$ (iv) $\frac{\text{Rise}}{2 * \text{Span}}$

(g) The shear force diagram of a uniformly loaded cantilever beam AB with "A" as fixed and "B" as free, is given by :

(i)


(ii)


(iii)


(iv)


2. Define the influence line. Draw the influence line diagram for bending moment at a section 'C', 3 m from end "A" of a simply supported beam AB of 12 m span. Also calculate the maximum bending moment at 'C' due to uniformly distributed rolling load 5 m long of 2 kN/m. (refer Figure 2) **2+12**

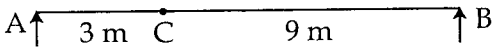


Fig. 2

3. (a) Define the distribution factor and carry over moments, used in moment distribution method. **4+10**

(b) Using the three moment theorem, analyse the continuous beam shown in Figure 3 and draw the neat bending moment diagram indicating values at critical points.

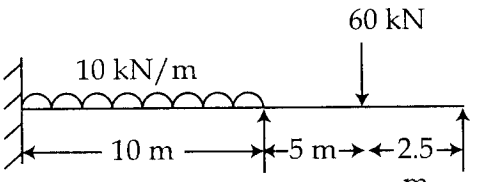


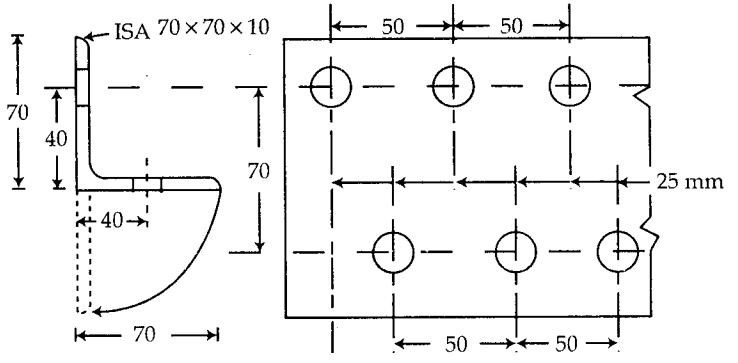
Fig. 3

4. (a) With the help of neat sketches describe the various types of failure of a rivetted joint. **6+8**

(b) Design a suitable fillet weld to connect a tie bar 60×8 mm to a 12-mm thick gusset plate. The permissible stresses in the tie bar and fillet weld are 150 MPa and 108 MPa respectively.

5. (a) Describe the biaxial bending action. **4+10**

(b) An angle iron ISA $70 \times 70 \times 10$ mm thick is used as a tension member and connected to a gusset plate by 16-mm diameter rivets through both legs (as shown in Figure 4). Find the allowable axial tension in the angle section if the permissible tensile stress is 150 MPa.



(Fig. 4)

6. (a) With the help of a neat sketch, describe the grillage base, used as a foundation. **6+8**

(b) A single angle 15 A $100 \times 75 \times 10$ mm is 3.0 m long and used as strut in the truss. It is connected to the gusset plates by means of 3 rivets at each end.

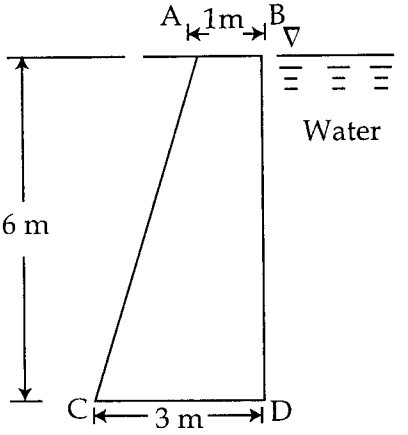
Find the safe load carrying capacity of this angle strut. (take $f_y = 250$ MPa)

For $f_y = 250$ MPa, allowable stress in axial compression (σac) is, as given below :

ρ/r	140	150	160	170	180
σac (μ/mm^2)	51	45	41	37	33

7. For the following masonary dam (shown in Figure 5) find the resultant maximum and minimum stresses at the base. **14**

Take the unit weight of masonary = 22 kN/m^3.



(Fig. 5)

8. Write short notes on **any four** of the followings : **4x3½=14**

(a) Efficiency of riveted joint

(b) Local buckling

(c) Degree of redundancy

(d) Lug angles

(e) Carry over moments

(f) Lap joint and butt joint