No. of Printed Pages : 7

BCE-032

02349

Diploma in Civil Engineering/Advanced Level Certificate Course in Civil Engineering DCLEVI/ACCLEVI

Term-End Examination

June, 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 tables is permitted.*

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

(a) The influence line diagram for shearforce at point 'P' in the following beam (Fig.1) will be

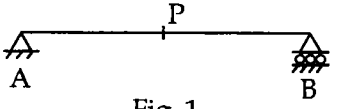
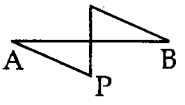


Fig. 1

(i)



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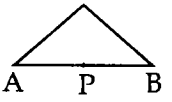

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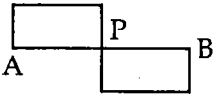

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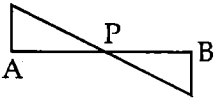


(b) A propped cantilever has :

(i) both ends fixed

(ii) one end hinged and other roller supported

(iii) one end fixed and other roller supported

(iv) One end fixed and other free.

(c) A rivet has a nominal diameter = d_n, gross diameter = d, maximum permissible shear stress = τ_{vf} : then the resistance of a rivet in single shear is given by :

(i) $\frac{\pi}{4} d^2 \tau_{vf}$ (ii) $\frac{\pi}{4} dn^2 \tau_{vf}$

(iii) $\pi d \tau_{vf}$ (iv) $\pi d^2 \tau_{vf}$

(d) In the following fillet weld, (Fig.2) the throat thickness of the weld is :

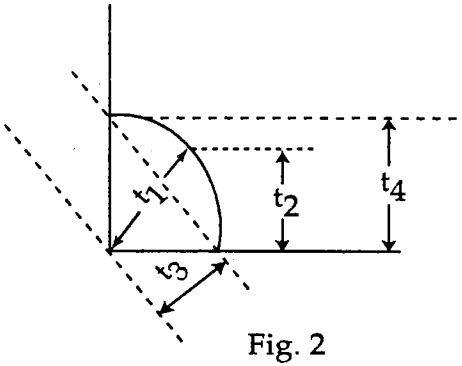


Fig. 2

(i) t_1 (ii) t_2

(iii) t_3 (iv) t_4

(e) The effective length of a column having unsupported length = L and both end fixed is given by

(i) 1.5 L (ii) 0.65 L

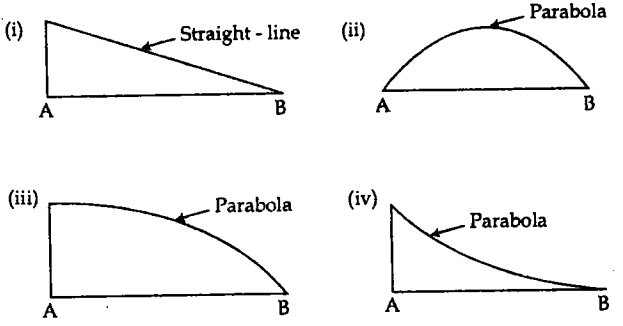
(iii) 1.00 L (iv) 1.2 L

(f) Slope of a roof truss is

(i) $\frac{\text{Rise}}{2^* \text{ span}}$ (ii) $\frac{\text{Rise}}{\text{span}}$

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

(g) The bending moment diagram of a uniformly loaded cantilever beam AB with end 'A' fixed and end 'B' as free is given by

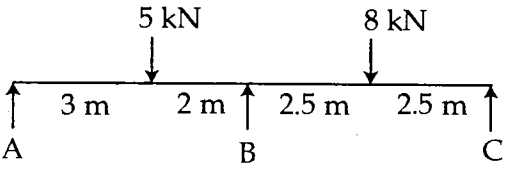


2. (a) Describe the properties of an influence line. 6+8

(b) With the help of a neat sketch describe the stability of a retaining wall in overturning.

3. (a) Describe the "Area moment theorems" and their use in structured engineering. **6+8**

(b) Analyse the beam (shown in Fig.3) using moment distribution method and draw the bending moment diagram indicating its values at critical points.



EI : Constant Throughout the span

Fig. 3

4. The plates of a boiler 6 mm thick are connected by a single rivetted lap joint with 16 mm dia rivets provided at 50 mm pitch. Calculate the efficiency of the joint. The allowable stresses are as below : **14**

in shear = 100 MPa

in bearing = 300 MPa

in tension (plate) = 150 N/mm^2

5. (a) With the help of a neat sketch, describe the "lug angles". Also mention the salient points to be considered while designing the connections of Angle Member with Lug angles. **6+8**

(b) As shown in Fig.4 discontinuous strut 1.75 m long (effective) consists of two equal angles ISA $50 \times 50 \times 6$ mm. It is connected to the same side of gusset plates by two rivets on each angle at both ends. Calculate the load which this strut can carry if yield stress of steel is 250 MPa.

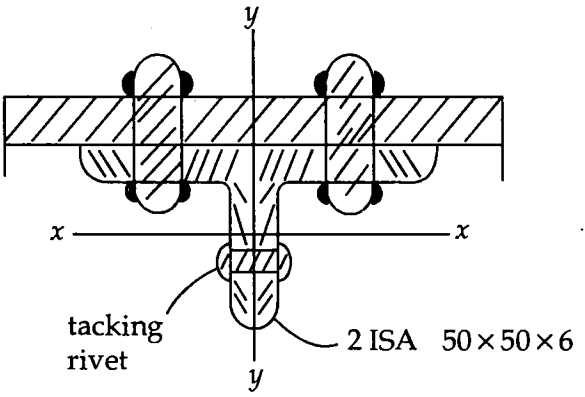


Fig. (4)

For $f_y = 250$ MPa. The allowable stress (σ_{ac}) in axial compression is given as below :

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

6. (a) For angle iron purlins (Fe 415) of a normal inclined roof truss, complete the following guidelines by filling up the blank space **3x2=6**

(i) The ratio of depth of purlin to its span should not be less than _____

(ii) The ratio of width of purlin to its span should not be less than _____

(iii) If the effect of wind loads are also included in the design of purlin then, the maximum bending stresses in compression or tension may be increased by _____ %.

(b) Draw bending moment diagrams for the beams shown in Fig. 5 and 6 **2x4=8**

(i)

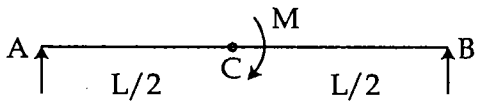


Fig. 5

(ii)

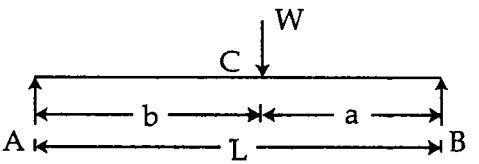


Fig. 6

7. (a) Discuss the advantages and disadvantages of welded joint as compared to rivetted joint. **6**

(b) Determine the size and length of the weld required to develop the full strength of the smaller plate in the joint shown in Fig. (7). Take permissible stresses in plate and weld as 150 MPa and 108 Mpa respectively. 8

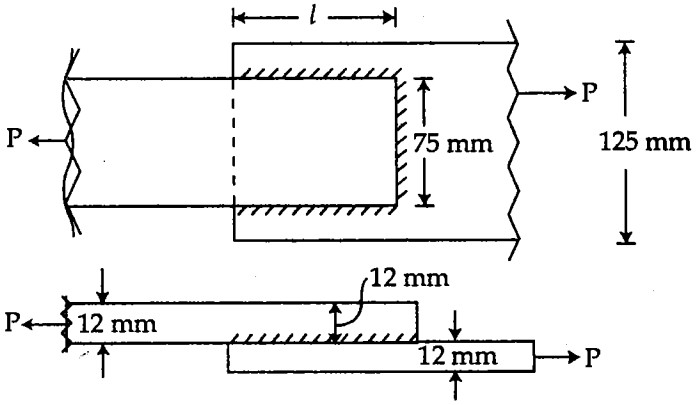


Fig. (7)

8. Write short notes on ***any four*** of the followings :

(a) Assumptions in the theory of Rivetted joint

(b) Slenderness ratio **4x3½=14**

(c) Tacking rivets

(d) Types of butt welds

(e) Euler's formula for critical load

(f) Local buckling

(g) Grillage base