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

00830

June, 2016

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. Total number of questions to be attempted are* ***five****. Assume suitable data wherever necessary and mention it clearly. Use of steel tables and scientific calculator is permitted.*

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

(a) Nominal diameter of a rivet is 16 mm. Gross diameter of the rivet is

(i) 18 mm

(ii) 16 mm

(iii) 17·5 mm

(iv) 17 mm

(b) Shear force in rolled steel beams is resisted by

(i) top flange only

(ii) flanges only

(iii) web only

(iv) both the flange and web

(c) Net cross-sectional area of a rivet jointed tension member is

(i) Area of the member divided by the area of the rivet holes

(ii) Area of the member minus twice the area of the rivet holes

(iii) Area of the member minus the area of the rivet holes

(iv) Area at the mid section

(d) The slenderness ratio of a compression member carrying compressive loads resulting from dead and superimposed loads only should be less than

(i) 350

(ii) 250

(iii) 180

(iv) 400

(e) The size of the 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 connected

(iii) Half the thickness of the thinner part connected

(iv) None of the above

(f) Maximum permissible eccentricity of load for no tension at the base of a masonry wall having a base width 'B' is

(i) B/3

(ii) B/6

(iii) B/4

(iv) B/2

(g) The ratio of depth of purlin to its span should be more than

(i) $\frac{1}{60}$

(ii) $\frac{1}{45}$

(iii) $\frac{1}{50}$

(iv) None of the above

2. Calculate the fixed end moments and the support reactions for the fixed beam shown in Figure 1. Also draw B.M. and S.F. diagrams. *14*

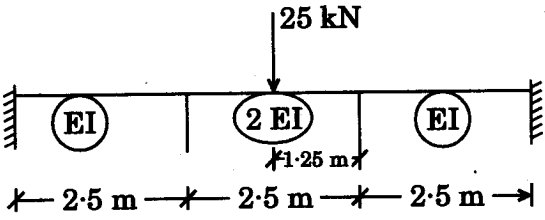

Figure 1

3. Design a simply supported I-section beam carrying a UDL of 35 kN/m. Effective span of the beam is 6 m and the compression flange may be assumed to be laterally supported throughout its length. Assume $f_y = 250\ N/mm^2$. *14*

4. (a) Discuss the steps to design a purlin of a roof truss. *5*

(b) Discuss the steps to design a built-up column. *5*

(c) Define Lug Angle. Discuss its utility. *4*

5. A portal frame is loaded as shown in Figure 2. Analyze the frame assuming the moment of inertia as shown in within circles. Draw B.M. and S.F. diagrams also. *14*

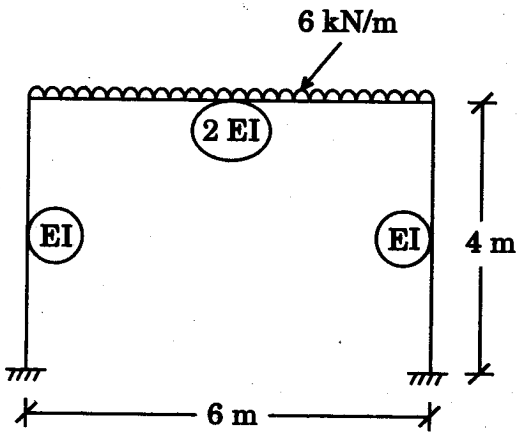

Figure 2

6. A masonry retaining wall of 6 m height is 1·5 m wide at top and 4·5 m wide at base. The water face of the wall is vertical. Calculate the maximum and minimum stresses at the base. Assume the weight of masonry as 22 kN/m^3 and free board as 500 mm. *14*

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

(a) Web buckling of I-section

(b) Grillage Base

(c) Euler's formula for critical load

(d) Stiffness of a beam and distribution factor in Moment Distribution Method

(e) Advantages of welding joint

(f) Lacing in compound columns

(g) Assumptions for the design of riveted joints

8. (a) A tension member consists of two IS angles of 150 × 75 × 10 mm. These angles are connected by their long legs to a 12 mm gusset plate by 16 mm diameter rivets (single row). Calculate the net effective area of the angles, if the angles are connected on the same side of the gusset plate and tack-riveted properly. 7

(b) Calculate the design load of a discontinuous strut of 1·9 m effective length as shown in Figure 3. It consists of two equal angles ISA 50 × 50 × 6 mm and is connected to the same side of gusset plate by two rivets on each angle at both ends. Assume yield stress of 250 N/mm^2.

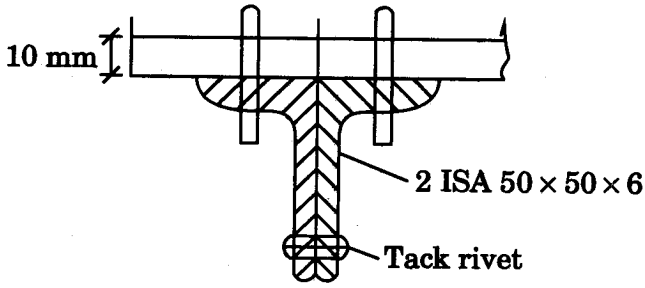

Figure 3

Allowable stress (σ_{ac}) in axial compression for F_y = 250 N/mm^2. 7

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