BCE-032

00529

Diploma in Civil Engineering
Term-End Examination
December, 2010

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*

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

   (a)   In pin joint plane trusses :

   (i)   pin joints behave as rigid joints

   (ii)   members are subjected to axial forces

   (iii)   members are subjected to shear forces and bending moments

   (iv)   members are subjected to shear forces and axial forces

BCE-032   1   . P.T.O.

(b) The moment required to rotate the near end of a prismatic beam through unit angle, without translation (the far end being fixed) is given by :

(i) $\dfrac{EI}{L}$ (ii) $\dfrac{2EI}{L}$

(iii) $\dfrac{3EI}{L}$ (iv) $\dfrac{4EI}{L}$

Where EI is flexural rigidity and L is span of beam

(c) Which of the following types of riveted joint is free from bending stress ?

(i) lap joint

(ii) butt joint with single cover plate

(iii) butt joint with double cover plate

(iv) none of the above

(d) A compression member consisting of angle sections may be a :

(i) continuous member

(ii) discontinuous single strut

(iii) discontinuous double strut

(iv) all the above

(e) The slenderness ratio of lacing flats should not exceed :

(i) 100

(ii) 120

(iii) 145

(iv) 180

(f) The shape factor for a solid circular section subjected to bending about its diameter is :

(i) 1.12

(ii) 1.5

(iii) 1.7

(iv) 2.0

(g) The channels or angles in the compression chords of the steel truss girder bridges are turmed outward in order to increase :

(i) cross -sectional area,

(ii) section modulus

(iii) torsional constant

(iv) radius of gyration

2. Draw Bending moment diagrams for the beams shown in Figures 1.(a) , (b), (c) and (d). Loads are shown in the figures.   **4x3½=14**
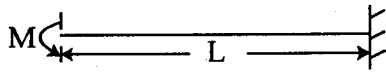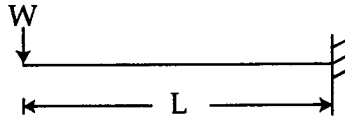
M ⊏━━━━━ L ━━━━⊐

Figure - 1 (a)

W
↓
⊢━━━━━ L ━━━━⊣

Figure - 1 (b)

W / unit length
⊂⊙⊙⊙⊙⊙⊙⊙⊙⊙⊙⊙⊃
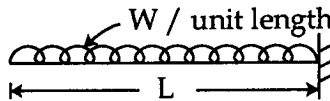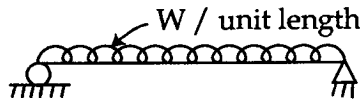⊢━━━━━ L ━━━━⊣

Figure - 1 (c)

W / unit length
⊂⊙⊙⊙⊙⊙⊙⊙⊙⊙⊙⊃

Figure - 1 (d)

3. Analyze the continuous beam shown in Figure 2.   **14** The beam has constant EI through out. Draw the BM and SF diagrams

10 kN
↓

A ▌━━━━━━━━━━━━━━━━━━━▲ B   E I = constant   ▲ C
          D
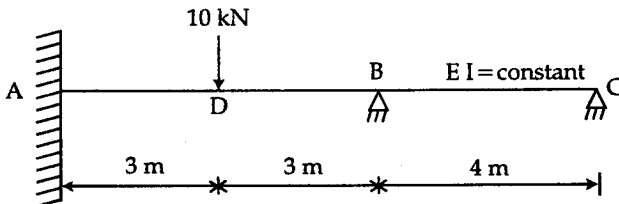
      3 m | 3 m | 4 m

Figure - 2

4. (a) Calculate the strength of a lap joint, per 7
        gauge length, used to connect two plates,
        12mm thick by power driven rivets.

    (b) What are the assumptions taken in the 7
        design of a riveted joint ?

5. (a) Diameter of rivets used is 10 mm. Gauge
        length for rivets is 10 cm. Determine the
        tensile strength of a roof truss diagonal
        $100 \times 75 \times 10$ mm (f_y=260 N/mm^2)
        connected to the gusset plate (shown in
        Figure 3)

        (i) 20 mm diameter power driven rivets 7
            in one row along the length of the
            member. The short leg of the angle is
            kept outstanding.
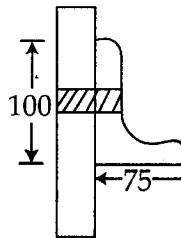
(a)

Figure - 3

    (b) Explain the procedure of calculating the 7
        'Distribution Factor' which is used in
        moment distribution method.

6. Calculate the safe axial load for a stanchion ISHB **14** 350 @ 724 N/w, 3.5m high. It is to be use as an uncased column in a single storey building. The column is restrained in position and against rotation at both the ends.

Take $f_y = 250N/mm^2$ $I_{xx} = 19802.8$ cm^4, $I_{yy} = 2510.5$ cm^4 and Area of cross section $= 9221$ mm^2. Value of σ_{ac} may be taken from the following table.

λ	σ_{ac} (MPa)
30	145
40	139
50	132
60	122

7. (a) Explain design of angle Iron Purlins in brief. **7**
    (b) What do you understand by effective length **7** of a column ? Explain how end conditions affect it.

8. Write short notes on *any four* of the following :
    (i)   Pratt truss   **4x3½=14**
    (ii)   Pressure on retaining walls due to liquids
    (iii) Slenderness Ratio
    (iv)   Carry over moments
    (v)   Loads acting on Roof Truss