DIPLOMA IN CIVIL ENGINEERING DCLE(G)

Term-End Examination

December, 2013

BCEE-061 : PRESTRESSED CONCRETE

Time : 2 hours   *Maximum Marks : 70*

*Note : Question No.1 is **compulsory**. Attempt **any four** questions from remaining questions. Use of calculator is **allowed**. Assume required data suitably, if found missing.*

1.   Choose the most appropriate answer from the given options :   **2x7=14**

   (a)   The minimum grade of concrete used in Pre-tensioned concrete structures is :

      (i)   M-20

      (ii)   M-25

      (iii) M-30

      (iv)   M-40

   (b)   Tensile strenght of concrete may be calculated from the relation :

      (i) $0.6 \sqrt{fck}$

      (ii) $0.5 \sqrt{fck}$

      (iii) $0.8 \sqrt{fck}$

      (iv) $0.7 \sqrt{fck}$

(c) The ideal profile of prestressing cable for a beam carrying UDL is :

    (i)   Passing through neutral axis

    (ii)   Parabolic

    (iii) With uniform eccentricity

    (iv) Linearly varying

(d) A bearing plate below an anchorage :

    (i)   is unsafe

    (ii)   distributes the force evenly

    (iii) is desired

    (iv) increases stress intensity in concrete

(e) Nominal maximum size of aggregate for concrete in a prestressed structure is :

    (i)   1/4 of the thickness of member

    (ii)   5 mm less than spacing between cables or strand provided in the member

    (iii) Greater of (i) & (ii)

    (iv) Smaller of (i) & (ii)

(f) Loss of prestress due to anchorage slip occurs in :

    (i)   pre-tensioned concrete

    (ii)   post-tensioned concrete

    (iii) both (i) & (ii)

    (iv) none of these

(g) Partial safety factor for wind load for (Dead load + wind load) combination is :

    (i)   1.2

    (ii)   1.5

    (iii) 1

    (iv) 0.8

2. (a) Explain the loss of pre-stress due to friction   7
         in a post-tensioned concrete beam.

    (b) A pre-tensioned concrete beam, of size   7
         100 mm × 250 mm, is pre-stressed by
         straight wires carrying an initial force
         200 kN at an eccentricity of 50 mm towards
         the soffit. Calculate the loss of prestress due
         to elastic deformation of concrete if area of
         steal wires is 240 mm^2.   Assume
         $E_c = 35$ kN/mm^2 and $E_s = 210$ kN/mm^2.

3. (a) Discuss flexure failures of prestressed   7
         concrete beams briefly.

    (b) Discuss reasons of variations in tendon   7
         stresses in post-tensioned concrete members.

4. Analyse the stress in extreme fibres at mid span   14
    of pre-stressed concrete 'I' beam (Fig 1). This beam
    supports an imposed load of 15 kN/m over a
    simple supported span of 11m. It has 3 cables,
    each cable containing 12 wires of 6 mm diameter.
    These cables are prestressed up to 1200 N/mm^2.
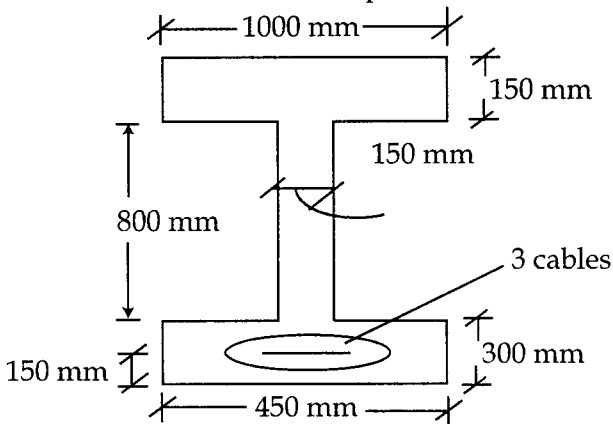   Assume a total 15% loss of prestress.

Fig. 1

5. (a) Discuss advantages of pre-stressed concrete   7
        as compared to Reinforced cement
        concrete.

   (b) Discuss steps to design a pre-stressed   7
        concrete Rectangular beam.

6. Write short notes on **any two** of the following :

   (a) Pre-stressed concrete poles   2x7=14

   (b) Limit state of service ability for pre-stressed
        members

   (c) Load balancing concept

7. (a) Discuss the reasons to provide high strength   7
        steel and concrete for pre-stressed concrete
        structures.

   (b) Discuss any one principle of providing   7
        anchorage in post-tensioning of concrete.

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