Diploma in Civil Engineering

Term-End Examination

December, 2011

01482

BCEE-061 : PRESTRESSED CONCRETE

Time : 2 hours   *Maximum Marks : 70*

Note : *Attempt FIVE questions including question No.1, which is **compulsory**. Use of scientific calculator is **allowed**. Assume any missing data suitably.*

1. Choose the most appropriate answer from the options given in each case.   **2x7=14**

   (a) For post-tensioned concrete members, minimum grade of concrete, specified by the code, is :

   (i) M 20   (ii) M 30

   (iii) M 40   (iv) M 50

   (b) Time dependent loss of stress in tendons may take place due to :

   (i) creep

   (ii) elastic shortening

   (iii) friction

   (iv) creep and friction

(c) Use of anchorages is needed in :

(i) Pretensioned concrete

(ii) Post tensioned concrete

(iii) Both of the above

(iv) None of the above

(d) A parabolic profile of a tendon is needed for load balancing of a :

(i) concentrated load

(ii) UDL

(iii) force system consisting of two point loads

(iv) none of the above

(e) Hoyer's long line system of prestressing is used for :

(i) pre tensioned concrete

(ii) post tensioned concrete

(iii) both the above

(iv) pre tensioned concrete as well as for short-length post tensioned concrete members.

(f) Split cone assembly is used in :

(i) Gifford Udall system

(ii) Lee McCall system

(iii) Magnel Blaton system

(iv) None of the above

(g)   Loss of stress in steel, with time when it is subjected to a constant strain, is called.

(i)   Creep   (ii)   Shrinkage

(iii) Relaxation   (iv)   Yield

2.   (a)   Write any three advantages of use of pre stressed concrete.   7

(b)   Discuss two cases when pre tensioning should be preferred to post tensioning.   7

3.   (a)   A beam is prestressed by a tendon cable having an initial prestress of 500 N/mm^2. Calculate percentage loss of prestress due to shrinkage of concrete if the beam is :   7
(i)   pretensioned, and

(ii)   Post-tensioned. Age of concrete at transfer is 7 days.

(b)   Describe any one system of anchoring tendons in post - tensioned construction.   7

4.   (a)   Draw a neat sketch of a Weinberg anchor clip and explain its use.   7

(b)   What do you understand by 'Hydrogen embrittlement' of tendons ?   7

5. (a) Explain the concept of pressure line briefly. 7

   (b) Discuss why the use of a good strength concrete and steel is desired in prestressed concrete ? 7

6. In a prestressed concrete beam, of cross section 300×400 mm (depth) and 6 m span, an initial prestressing force of 400 kN is applied at an eccentricity of 50 mm. Area of tendons is $400 mm^2$. Find the total percentage loss of prestress in tendons. 14

   Use the following data :

   $E_s = 2 \times 10^5$ N/mm^2

   $E_c = 0.33 \times 10^5$ N/mm^2

   Slip in anchorage $= 1.5$ mm

   Creep coefficient in concrete $= 1$

   Shrinkage strain of concrete $= 0.0002$

   Loss due to relaxation $= 3\%$

7. Write short notes on *any two* out of the following : 2x7=14

   (a) Failures in prestressed beams

   (b) Prestressed poles

   (c) Limit states for design of prestressed concrete beams.