Diploma in Civil Engineering

Term-End Examination

June, 2010

BCEE-061 : PRESTRESSED CONCRETE

Time : 2 hours   *Maximum Marks : 70*

Note :   *Question number 1 is* **compulsory.** *Out of the remaining questions, attempt* **any four.** *Use of calculator is permitted. Assume any missing data if required, suitably. Use of any Indian standard code is NOT permitted.*

1.   Choose the most appropriate answer in each case, out of the given options :   **2x7=14**

   (a)   Ducts may be grouted

   (i)   in pre - tensioned members

   (ii)   in post - tensioned members

   (iii)   in pre and post - tensioned members both

   (iv)   neither in pre - tensioned nor in post - tensioned members

   (b)   A straight tendon, provided concentrically in a prestressed concrete beam, shall :

   (i)   balance the externally applied transverse loads

   (ii)   balance the externally applied transverse loads only upto some extent

   (iii)   not balance the externally applied transverse loads

   (iv)   be completely useless in all respects

(c) Profile of tendons in a simply supported beam should be parabolic in the case of external load being :
(i) a point load
(ii) a combination of two point loads
(iii) a UDL
(iv) none of the above

(d) Which of the following is a time dependent process ?
(i) Loss due to elastic shortening
(ii) Loss due to friction
(iii) Loss due to creep
(iv) Loss due to slip in anchorage

(e) For a pre - tensioned concrete beam :
(i) M 25 concrete may be used.
(ii) M 30 concrete may be used.
(iii) M 45 concrete may be used.
(iv) Either of M 30 and M 45 concrete may be used.

(f) For a prestressed concrete pipe :
(i) Longitudinal prestressing is needed
(ii) Circumferential prestressing is needed
(iii) Both of the above are needed
(iv) Longitudinal prestressing with ordinary reinforcement along circumference is needed

(g) For prestressed concrete :
(i) Tendons may not be of mild steel practically
(ii) Water cement ratio should be low

(iii) Anchorages are not required if it is a case of pre - tensioned concrete

(iv) All the above are true

2. Fig (1) shows the mid span cross - section of a **14** post - tensioned beam of 24 m span. There are 6 cables, each of 12 wires of 5 mm diameter. The effective prestress in cables, after all losses have taken place, is 1000 N/mm^2. Compute the top and bottom fibre stresses at the section. At the mid span section, shown in the figure, the location of all cables is 200 mm from the soffit of beam. The beam carries a live load of 9 kN/m in addition to its own weight. Take density of concrete as 24 kN/m^3.
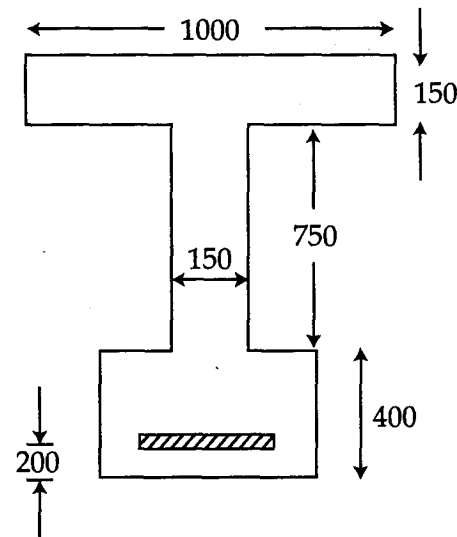

Fig (1) : (All dimensions are in mm. The sketch is not to scale)

3. (a) Explain different types of tensioning devices. 7

(b) How the effect of creep is considered in the design of prestressed concrete members ? 7

4. (a) Discuss why anchorages are not needed in pre-tensioned concrete members. 7

(b) What is the purpose of using splices in prestressed concrete members ? Give one example of a splice. 7

5. (a) What do you understand by a 'Pressure Line' ? 7

(b) Write some important considerations in the design of prestressed poles. 7

6. (a) Explain how the loss of prestress due to shrinkage of concrete is considered for post - tensioned concrete members. 7

(b) What is the effect of prestressing on the shear resistance of concrete ? Explain. 7

7. Write short notes on *any four* of the following :

3½x4=14

(a) Design of rectangular prestressed beams

(b) Relaxation of steel

(c) Initial and final prestresses

(d) Effect of grouting of ducts in post-tensioned concrete members.

(e) Steel used for tendons