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BCEE-061

Diploma in Civil Engineering

01615

Term-End Examination

June, 2012

BCEE-061 : PRESTRESSED CONCRETE

Time : 2 Hours *Maximum Marks : 70*

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

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

(a) Stress due to eccentric prestressing only, at an extreme fibre of a prestressed beam of cross sectional area A, may be given as :

(i) $\frac{P}{A} \pm \frac{I}{Pey}$ (ii) $\frac{A}{P} \pm \frac{Pey}{I}$

(iii) $\frac{P}{A^2} \pm \frac{P^2ey^3}{12\,I}$ (iv) $\frac{P}{A} \pm \frac{Pey}{I}$

(b) The word 'Dorland' is associated with :

(i) an anchorage system

(ii) a split cone assembly

(iii) tendons

(iv) a clip

(c) A bearing plate below an anchorage :

(i) Increases stress intensity in concrete

(ii) distributes the force evenly

(iii) is unsafe

(iv) is desired so that tendons do not break.

(d) The Lee McCall system uses :

(i) wedges

(ii) nuts and threaded bars

(iii) split cones

(iv) Steel wedge and plates.

(e) Splices are used for :

(i) holding tendons with correct profile

(ii) joining tendons

(iii) positioning anchorages

(iv) stretching tendons.

(f) Modulus of elasticity of concrete may be given as :

(i) $5000\ (f_{ck})^{1/3}$

(ii) $5700\ (f_{ck})^{1/3}$

(iii) $5700\ (f_{ck})^{1/2}$

(iv) $5000\ (f_{ck})^{1/2}$

(g) Value of creep coefficient for concrete :

(i) increases with age at loading

(ii) decreases with age at loading

(iii) remains constant and does not depend on age at loading

(iv) depends on type of anchorage system used in prestressed concrete.

2. (a) Describe the concept of load balancing briefly. 7

(b) Explain the utility of Hoyer's long line system of prestressing with a neat sketch. 7

3. A concrete beam 150 mm × 300 mm (depth) is pre - tensioned by 7 wires of 7 mm diameter at an initial stress of 1000 N/mm^2. All the tendon wires have an eccentricity of 50 mm. 14

Find loss of prestress due to :

(a) Elastic shortening

(b) Creep of concrete

(c) Shrinkage of concrete and

(d) Relaxation of steel

Use the following data.

E_S = 200 kN/ mm^2

E_c = 36050 N/ mm^2

Creep coefficient = 1.6

Shrinkage strain = 3×10^{-4}

Relaxation in steel = 8%

4. (a) Write any three advantages and applications, each for prestressed concrete. 7

(b) Discuss the concept of pressure line briefly. 7

5. (a) Explain the loss of prestress due to friction in post - tensioned concrete members. 7

(b) Compute stresses at midspan section in bottom fibres in a simply supported pre-stressed concrete beam with a rectangular cross section 250 mm wide and 350 mm deep span of beam is 5 m. Consider self load of the beam and an imposed load of 5 kN/m over the entire span . A prestressing force of 300 kN is applied concentrically. Density of concrete may be taken as 25 kN/m^3. 7

6. (a) Discuss secondary stresses due to tendon curvature. 7

(b) Make a comparison of pre and post - tensioning in brief. 7

7. Write short notes on ***any two*** of the following : **7x2=14**

(a) Prestressed concrete pipes

(b) Chemical prestressing

(c) loss of prestress due to slip of anchorage.