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BCEE-061

DIPLOMA IN CIVIL ENGINEERING

DCLE(G)

Term-End Examination

December, 2015

BCEE-061 : PRESTRESSED CONCRETE

Time : 2 hours *Maximum Marks : 70*

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

1. Choose the most appropriate answer from the given options. *7×2=14*

(a) Minimum grade of concrete used for post-tensioned concrete structures is

(i) M-30

(ii) M-35

(iii) M-25

(iv) M-40

(b) Modulus of concrete for any design of prestressed concrete structure may be assumed as

(i) $5000\sqrt{f_{ck}}$

(ii) $4500\sqrt{f_{ck}}$

(iii) $5700\sqrt{f_{ck}}$

(iv) None of these

(c) Nominal maximum size of coarse aggregate for prestressed concrete structure is

(i) 5 mm less than spacing between cables

(ii) $\frac{1}{4}$ of thickness of member

(iii) Smaller of (i) and (ii)

(iv) Greater of (i) and (ii)

(d) As compared to RCC beam, the size of prestressed concrete beam for the same span and loading is

(i) less

(ii) equal

(iii) more

(iv) None of these

(e) Splices are used for

(i) positioning anchorages

(ii) stretching tendons

(iii) holding tendons with correct profile

(iv) joining tendons

(f) Value of shrinkage strain for concrete of post-tensioned structures

(i) decreases with age of members

(ii) increases with age of members

(iii) remains constant

(iv) depends on type of anchorage system

(g) Partial safety factor for live load for limit state of collapse required for the load combination of (DL + LL + WL) is

(i) 1·0

(ii) 0·8

(iii) 1·2

(iv) 0·9

2. (a) Describe briefly the stress concept for the analysis of a prestressed beam. 7

(b) Compare briefly the pre-tensioning and post-tensioning methods of pre-stressing. 7

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

(b) A pre-tensioned concrete section of size 150 mm × 300 mm is carrying a pre-stressing force of 300 kN. Calculate the loss of pre-stress due to elastic deformation, if constant eccentricity towards soffit is 50 mm. Assume $E_c = 35\ kN/mm^2$ and $E_s = 210\ kN/mm^2$. 7

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

(b) Discuss the advantages of prestressed concrete as compared to reinforced concrete. 7

5. (a) Discuss the steps to design a prestressed concrete rectangular beam. 7

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

6. (a) A concrete beam of 250 mm × 500 mm (deep) is pre-tensioned by 9 wires of 7 mm diameter with initial stress 1200 N/mm^2. Calculate the stresses at the mid-span in top and bottom fibres, if eccentricity of pre-stressing force is 60 mm at mid-span and the beam carries an imposed load of 10 kN/m over a simple supported span of 8 m. 7

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

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

(a) Secondary stresses due to tendon curvature

(b) Pre-stressed concrete pipes

(c) Salient codal provisions of serviceability of pre-stressed concrete members