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320875(20)

B. E. (Eighth Semester) Examination, April-May 2020

(Old Scheme)

(Civil Engg.)

PRESTRESSED CONCRETE STRUCTURES

Time Allowed : Three hours

Maximum Marks : 80

Minimum Pass Marks : 28

Note : *Attempt all questions. Part (a) is compulsory. Attempt any* ***two*** *part from (b), (c) & (d). Solve for only 16 marks from each question.*

Unit-I

1. (a) Give reason for using high strength concrete and high tensile steel in pre-stressed concrete. 2

(b) Name different types of pre-stressing systems and explain in details Freyssinet system. 7

(c) 'In prestressing system the dead loads are carried free of cost." Explain the statement. 7

(d) A pre-stressed beam of rectangular section is 300 × 600 mm deep has a simply supported span of 10·0 m. The effective prestressing force is 1000 kN at an eccentricity of 100 mm. Considering the D.L. as 4·5 kN/m the beam has to carry a live load 7·5 kN/m. Determine the extreme stresses at :

(i) End section

(ii) Mid section without action of live load

(iii) Mid section with action of live load 7

Unit-II

2. (a) Define kein distance. 2

(b) A simply supported pre-stressed concerete beam of 300 mm × 600 mm section has a span of 6·0 m. The external load on beam is 150 kN acting of mid span. The prestressing cable has a centroidal dip of 100 mm at mid span and zero at support. The cable is straight between ends and mid span for a final

prestressing force of 1100 kN calculate extreme fibre stresses at mid span of different concepts. 14

Or

Design a pre-stressed concrete slab using M40 grade concrete and 12 5 prestressing cable initially stressed to a pull of 1100 N/mm^2 for an imposed load of 14 kN/m^2 over a simply supported span of 15·0 m. No tension to be allowed on the section. The cable duct will be grouted before application of load. Allow 18% loss of pre-stress.

Unit-III

3. (a) The post tensioned members do not suffer the loss of pre-stress due to elastic deformation, why. 2

(b) "The Indian standard code IS : 1343 specified different strains for pretensioned and post tensioned members." Explain with reasons. 7

(c) A concrete beam AB of 20·0 m span is post tension at end A. The cable is parabolic with central dip of 400 mm at mid span and zero at ends A and B. The coefficient of friction between duct and cable is

0·35 and friction coefficient for wave effect is 0·15 for 100 m. Calculate the loss of pre-stress :

(i) assuming jacking at one end and

(ii) assuming jacking is done at both ends 7

(d) A prestressed concrete beam of rectangular section 250 mm wide × 350 mm deep is provided with 12 high tension wires 6 mm diameter located 70 mm from bottom and 4 similar 6 mm wires located at 40 mm from top of beam. The wires are initially stressed to 900 N/mm^2. Determine the percentage loss of stress due to elastic shortening of concrete. $E_S = 2{\cdot}10 \times 10^5$ N/mm^2 and $E_C = 3{\cdot}5 \times 10^4$ N/mm^2. 7

Unit-IV

4. (a) Explain the salient points of propped method of construction and unpropped method of construction. 2

(b) A composite beam consists of a 300 mm × 900 mm deep precast and 1000 × 120 mm size cast in situ flange. The stem is post tensioned unit with initial pre-stress of 2500 kN applied at 200 mm distance from bottom fibre. After losses the stressing force is 2100 kN. The D.L.B.M. at mid span due to wt. of

precast stem is 250 kN/m and D.L.B.M. due to flange is 111 kNm. Later it carries a L.L.B.M. of 700 kNm.

Determine the stress distribution in concrete of various stages of loading. 14

Or

A composite T-beam is made up of a precast pretensioned rib 100 mm × 200 mm deep and cast in situ slab 400 mm wide and 40 mm thick having modulus of elasticity 28 kN/mm^2. If the differential shrinkage is 100×10^{-6} units. Determine the shrinkage stresses developed in precast and cast in situ units. 14

Unit-V

5. (a) State important criteria concerning prestressed concrete for the ultimate limit state. 2

(b) What are the advantages of limit state method over working stress method? 7

(c) What are advantages of using precast prestressed concrete poles? 7

(d) A multistoreyed building to be supported on precast prestressed concrete piles foundation. The piles have effective length of 5·0 m and the support a total service load of 1200 kN. Design a suitable pile assuming uniform load factor of 2·0 at collapse. The piles are to be lifted at any point during construction. 7