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320845(20)

B. E. (Eighth Semester) Examination, April-May 2021

(Old Scheme)

(Civil Engg.)

PRESTRESSED CONCRETE STRUCTURES

(Elective-III)

Time Allowed : Three hours

Maximum Marks : 80

Minimum Pass Marks : 28

Note : *Attempt all questions and all question carry equal marks. Part (a) is compulsory and attempt any* ***one*** *parts from rest two parts (b) and (c).*

Unit-I

1. (a) What is prestressed concrete? 2

(b) Describe the advantages of prestressed concrete and differentiate between full prestressing and partial prestressing. 14

(c) Describe with suitable sketches either the freyssinet system or magnel blaton system for construction of post-tensioned prestressed concrete beams. 14

Unit-II

2. (a) Define pressure line. 2

(b) Explain concept of load balancing in prestressed concrete members and also define eccentric tendon. 14

(c) A rectangular prestressed beam 150 mm wide and 300 mm deep is used oven an effective span of 10 m. The cable with zero eccentricity at the supports and linearly varying to 50 mm at the centre, carries an effective prestressing force of 500 kN, find the magnitude of the concentrated load Q located at the centre of the span for the following conditions at the centre of span section : 14

(i) If the load counteracts the bending effect of the prestressing force (Neglecting self weight of beam)

(ii) If the pressure line passes through the upper kern of the section under the action of the external load, self weight and prestress.

Unit-III

3. (a) What is creep of concrete? 2

(b) (i) List various types of loss of prestress in pretensioning and post tensioning. 4

(ii) A pretensioned concrete beam of rectangular cross section 150 mm wide and 300 mm deep is prestressed by eight high tensile wires of 7 mm diameter located at 100 mm from the soffit of the beam. If the wires are tensioned to a stress of 1100 N/mm^2, calculate the percentage loss of stress due to elastic deformation assuming the modulus of elasticity of concrete and steel as 31·5 and 210 kN/mm^2. 10

(c) A prestress concrete beam with a rectangular section 120 mm wide by 300 mm deep supports a uniformly distributed load of 4 kN/m, which includes the self weight of the beam. The effective span of the beam is 6 m. The beam is concentrically prestressed by a

cable carrying a force of 180 kN. Locate the position of the pressure line in the beam. 14

Unit-IV

4. (a) Name different types of composite construction. 2

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

(c) A composite bridge deck is made up of a pretensioned rectangular beam having a width of 300 mm and depth of 600 mm. The cast insitu slab is 500 mm wide by 150 mm thick. The ultimate shear force at the support section is 392 kN. 14

(i) Estimate the horizontal shear stress at the junction of precast and in situ slab.

(ii) Neglecting the shear resistance between the surface design suitable verti reinforcements to resist the shear force at support section. Using Fe-415 HYSD bars.

Unit-V

5. (a) Define limit state method. 2

(b) (i) Write some important criteria. concerning prestressed concrete. 4

(ii) What are the advantages of limit state method over working stress method. 10

(c) A prestressed concrete pipe is to be designed to withstand a fluid pressure of 1.6 N/mm^2. The diameter of the pipe is 1200 mm and shell thickness is 100 mm. The maximum compressive stress in concrete at transfer is 16 N/mm^2. A residual compression of 1 N/mm^2 is expected to be maintained at service loads. Loss ratio is 0.8 high tensile wires of 5 mm dia initially stressed to 1 kN/mm^2 are available for use, determine : 14

(i) The no. of turns of wire per meter length

(ii) The pitch of wire winding