COURSE CODE (CREDITS): 18B11CE735 (3)   MAX. MARKS: 25

COURSE NAME: Design of Prestressed Concrete Structures

COURSE INSTRUCTORS: Dr. Saurav   MAX. TIME: 1.5 Hour

Note: All questions are compulsory. Marks are indicated against each question in square brackets.

Q1. In a prestressed concrete beam of cross section 200mm×300mm and a span 6m, an initial prestressing force of 400kN is applied at an eccentricity of 70mm by tendons of area 400mm^2. Assuming Es= 2 ×10^5 N/mm^2 and Ec= 0.33 ×10^5 N/mm^2 anchorage slip =1.5mm; creep coefficient=1, shrinkage strain=0.002 and creep loss=3%, find the total percentage loss of stress in the tendons.   [5, CO1, 3]

Q2. A simply supported post tensioned concrete beam of span 15m has a rectangular cross section 300mm×800mm. the prestress at ends is 1300kN with zero eccentricity at the supports and an eccentricity of 250mm at the center, the cable profile being parabolic. Assuming k=0.15per 100m and μ= 0.35 determine the loss of stress due to friction at the centre of the beam.   [5, CO1, 3]

Q3. A prestressed concrete beam of rectangular section 125 mm wide and 300mm deep. The beam is prestressed with a cable provided along the longitudinal centroidal axis. The effective prestressing force is 180kN. The beam carries an udl of 2.25kN/m including the weight of the beam. Locate the pressure line for the beam at every 1m from either ends. Span of the beam is 8m.   [5, CO1, 2]

Q4. A prestressed Concrete pile 250mm square contains 60 pretensioned wires each 2mm diameter uniformly distributed over the section. The wires are initially tensioned on the prestressing bed with a total force of 300kN. Calculate the final stress in concrete and the percentage loss of stress in steel after all losses. Given, E$_s$= 210 kN/mm^2, E$_c$= 32 kN/mm^2, Creep shortening =30 ×10^{-6} mm/mm per N/mm^2 of stress. Total shrinkage = 200×10^{-6} per unit length, steel relaxation = 5%, P= 300kN, A$_s$=188.4 mm^2 [5, CO1, 3]

Q5. Determine the various stresses set up at mid span section in a pretensioned beam 250mm ×500mm subjected to an initial prestress of 1500kN and a uniformly distributed superimposed load of 5kN/m over a span of 15m. Assume total loss of 12% and eccentricity of prestress at mid span is 100mm   [5, CO1-3]