Midterm Exam 2010-10-25, Deformation of concrete

1. The bridge frame is made up of composite beams AB, BC, CD and a steel section for columns BE and CF for which the cross section at mod-spans is shown in the following figure. Find the changes in the reactions and in the stress distribution in the cross section at G due to creep and shrinkage of deck slab occurring during t0 to t1. Also calculate the deflection at time t1 at the center of BC and change in the value during the period t0 and t1. The cross-section properties of columns are: for columns BE and CF, area=20,000 mm2 and moment of inertia about an axis through centroid = 0.012 m4. The material properties are : 
2. Three precast simple beams are prestressed and made continuous at age t0 by a reinforced concrete joint cast in-situ. It is required to find the bending moment diagram at time t after t0. Assume no cracks are produced at the casting joint and that joint results in perfect continuity. The initial prestress at to create a uniformly distributed upward load of intensity (2/3)q; thus



where P is the absolute value of the prestress force; a and *l* are defined in the figure; *q* is the weight per unit length of the beam. Prestress loss is to be assumed uniform and equal to 20 percent of the initial prestress. Creep coefficient; aging coefficient,.