B.Tech. Degree IV Semester (Special Supplementary) Examination, March 2007

CE 403 ANALYSIS OF STRUCTURES I

(1999 Admissions onwards)

Time: 3 Hours Maximum Marks: 100

(***All*** questions carry ***EQUAL*** marks)

I a) State Maxwell's reciprocal theorem.

b) A pin jointed frame shown in figure 1 is hinged to support at A and on roller bearing at B. There is a uniform rise of temperature in all members by 20°C above the temperature at which frame was erected. Coefficient of linear expension = 1.1×10^{-5}/°C. Find the vertical displacement of 'C' consequent on rise of temperature.

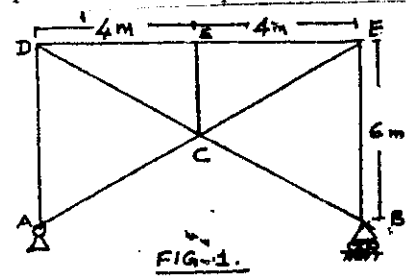

FIG-1.

OR

II a) Derive expressions for Castagleano's theorems used in the calculation of deflections

b) Determine the vertical deflection at point C of the structure shown in figure 2. Cross section of AB=100mm^2 and AC and BC = 150mm^2. E=2 x 10^5N/mm^2. Use method of virtual work.

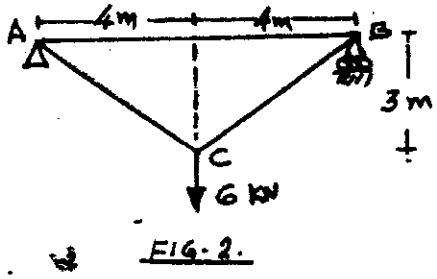

FIG-2.

III a) Determine the criteria for maximum B>M to occur at any given point in a beam due to a number of concentrated loads moving at fixed distances between them.

b) Find absolute maximum bending moments in a beam of span 40m. Crossed by a system of loads comprising of 20KN, 60KN and 40KN loads at 2m and 3m apart respectively.

OR

IV A simply supported beam has a span of 20m and a rolling load of 20KN/m and 25m long rolls over the beam from left to right. Determine the maximum bending moment and shear force at a section 10m from the left end. Determine also the absolute maximum bending moment.

V A prat truss has 6 bags of 4m each. The height of the truss is 4m. Draw the influence lines for the forces in the Mumbers of second bay. The self weight of the truss is 6 KN/m. Check whether any counterbracing is required. Take live load of 4KN/m longer than the span is moving on the truss.

OR

VI Find wheel loads 120KN, 200KN, 200KN, 80KN and 80KN cross a girder of 24m space from left to right with 120KN wheel load leading. The spacing between the loads in the same order is 2,2.25, 2 and 1.75. Using influence line diagram, calculate the shear force and bending moment at a section 10m from the left hand support, where the 120KN load is at the centre of the span.

VII A suspension bridge of span 250m has two hinged stiffening girders supported by two cables having a dip of 20m. Width of roadway is 8m. The self weight of the bridge is 4KN/m^2 and the live load is 12KN/m^2 covering ¾ of the span. Determine the maximum shear force and bending moment at a section 50m. from the right end. Determine also the tension in the cable.

OR

VIII The cables of a suspension bridge 80m span and 8m dip are stiffened by three hinged stiffening girder to retain the parabolic shapes. Dead load is 10KN/m uniformly distributed load and live load 20KN/m and 20m long. Calculate the maximum cable tension when one end of the live load is just at the central hinge of the girder. Sketch the SF and BM diagrams and show the maximum positive and negative values.

IX A three hinged parabolic arch has a span of 24m and a rise of 6m. Draw the influence lines for (i) horizontal thrust (ii) bending moment at $\frac{1}{3}$ span. Determine the maximum bending moment at $\frac{1}{3}$ span when a point load of 60KN is crossing the arch.

OR

X A two hinged arch of span 20m and rise 4m is loaded with a concentrated load of 100KN at a point 5 m from left hand support. The moment of inertia at any section is $I_c \sec\theta$, where θ is the slope at the section and I_c is the moment of inertia of crown. Effect of rib shortening is to be neglected. Find horizontal thrust and bending moment at the loaded point.

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