Name:_____

Roll No._____

Department of Civil Engineering

NATIONAL INSTITUTE OF TECHNOLOGY CALICUT

CE2008D STRUCTURAL ANALYSIS I

Winter 2019-20

Interim Test – 21 Feb 2020

Time: 90 minutes | Maximum Marks: [30]

*Answer **all** questions; Provide neat sketches; Assume missing data after stating; Read the questions carefully*

1. A short column has a hollow circular cross-section with outside diameter 150 mm and inside diameter 130 mm. If a compressive load P = 200 kN acts eccentrically at the middle thickness of the wall as shown in Fig. 1, find the maximum and minimum stresses developed. [4]

2. (a) A hinged-hinged column carries an axial compressive load P. Write the governing differential equation and the boundary conditions. Solve and determine the critical load. [4]

   (b) If a hinged-hinged column is 6 m long, has an I-section with $I_{xx} = 6.5\times10^8$ mm^4 and $I_{yy} = 1.8\times10^7$ mm^4, calculate the Euler buckling load. E= 200 GPa. [2]

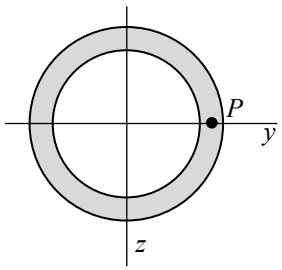

Figure 1

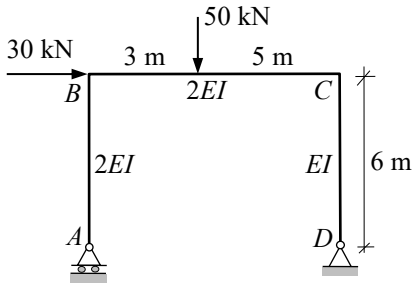

Figure 2

3. Find the horizontal deflection and rotation of joint B of the plane frame shown loaded as in Fig. 2 using the *unit load method*. Given: E = 200 GPa and $I = 5\times10^8$ mm^4. Note the different EI values. [6]

4. For the beam shown in Fig. 3, calculate the slope and deflection at C using the *strain energy method*. Note the different EI values. Given: E = 200GPa; $I = 8\times10^7$ mm^4. [6]

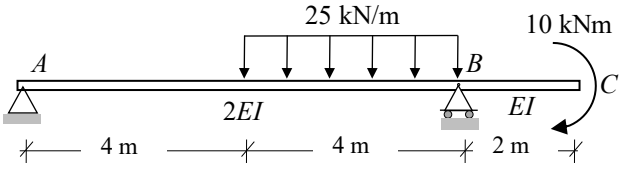

Figure 3

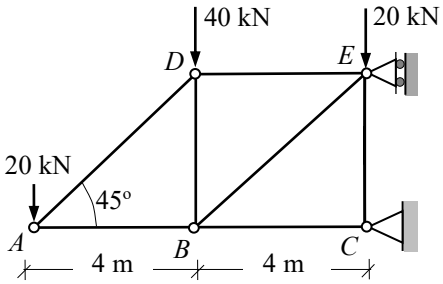

Figure 4

5. For the truss shown in Fig. 4, the cross-sectional area of each bar is 10^{-4} m^2 and $E = 2\times10^8$ kN/m^2:

   (a) Find the *vertical deflection* at A due to the loads shown using the *unit load* method. [6]

   (b) Find the vertical deflection at A of the truss with *no loads* if the temperature of the members AD and DE are increased by 60°C. The coefficient of thermal expansion is $\alpha = 12\times10^{-6}$/°C. [4]