Karunya University
(Karunya Institute of Technology and Sciences)
(Declared as Deemed to be University under Sec.3 of the UGC Act, 1965)

End Semester Examinations - 2015-16 Even Semester - May 2016

15AE3009 Finite Element Analysis in Aerospace Application

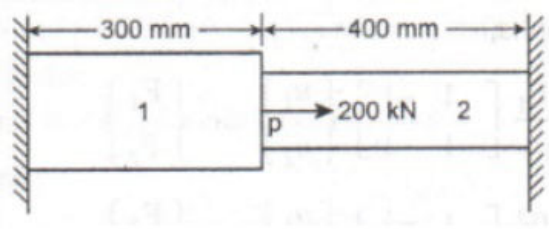
Set A

Time : 3 hrs
Total Marks: 100

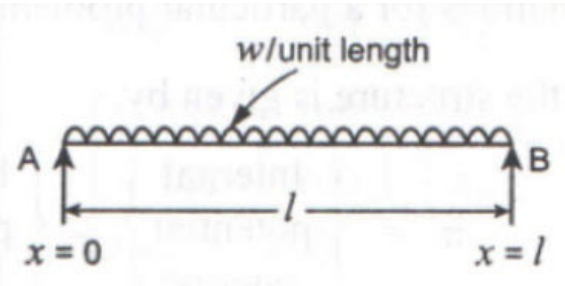
1. Explain the step by step procedure involved in solving the FEA problem.

OR

2. Consider a bar as shown in figure. An axial load of 200 kN is applied at point P. Take A_1 = 2400 mm^2, E_1 = 70 X 10^9 N/m^2, A_2 = 600 mm^2, E_2 = 200 X 10^9 N/m^2. Calculate the nodal displacement at point P and stress in each material.



3. A simply supported beam subjected to uniformly distributed load over entire span. Determine the bending moment and deflection at midspan by using Rayleigh Ritz method.



OR

4. Derive the shape function for a beam element.

5. Find the shape function for a one dimensional linear triangular element in global co-ordinate system.

OR

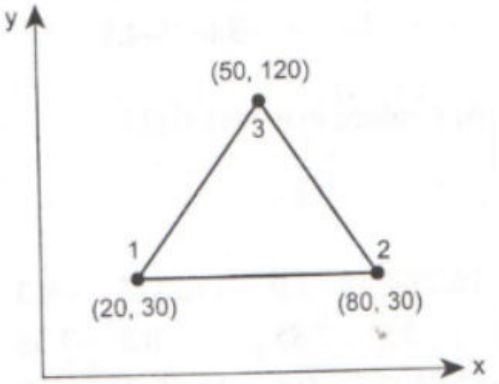
6. Find the shape function for a one dimensional linear bar quadratic element.

7. For the plane stress element shown in figure the nodal displacements are

u_1 = 2.0 mm; v_1 = 1.0 mm;

u_2 = 0.5 mm; v_2 = 0.0 mm;

u_3 = 3.0 mm; v_3 = 1.0 mm;

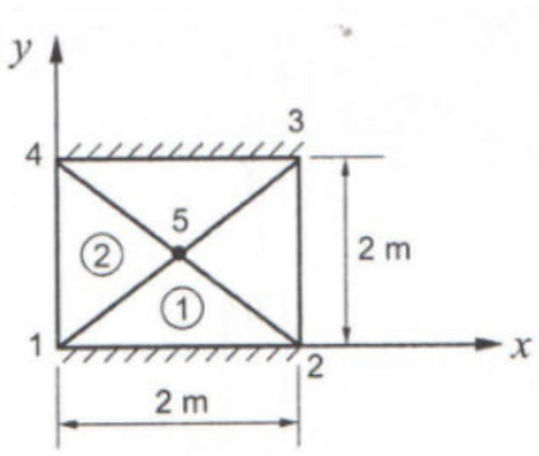


Determine the element stress σ_x, σ_y, τ_{xy}, σ_1, and σ_2 and the principal angle θ_p. Let E = 210 GPa, ν = 0.25 and t = 10 mm. All co-ordinates are in millimeters.

OR

8. Find the shape function for eight nodded rectangular element in natural co-ordinate system.

9. For the two dimensional sandy soil region shown in figure determine the potential distribution and velocity gradient. The potential (fluid head) on the left side is a constant 10.0 m, and that on the right side is 0.0 m. the upper and lower edges are impermeable. The permeabilities are $k_x = k_y = 25 \text{ X } 10^{-5}$ m/s. Assume unit thickness.



Wishing you All the Best
