CODE: 17CD03101

M. Tech I Year I Semester Supplementary Examinations, May 2018

ADVANCED FINITE ELEMENET METHODS

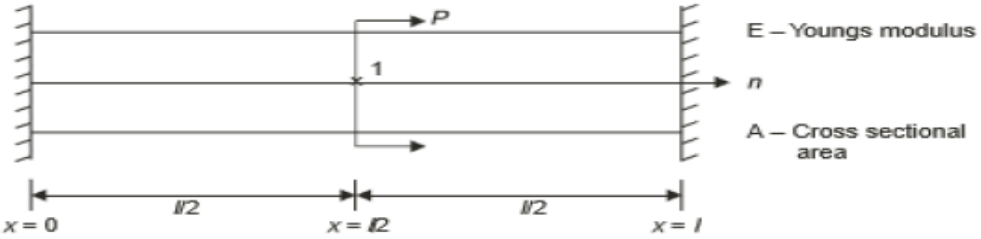
(CAD/CAM)

Time : 3 hours Max Marks : 60

Answer all **five** units. (5 x 12 = 60 Marks)

UNIT-I

1. Using Rayleigh-Ritz method, determine the expressions for displacement and stress in a fixed bar subject to axial force P as shows in Figure. Draw the displacement and stress variation diagram. Take 3 terms in displacement function.

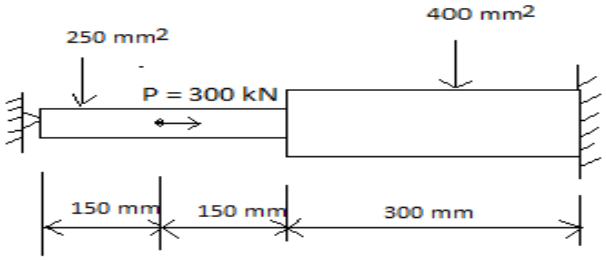


OR

2. Describe the step wise Finite Element Method procedure to solve a problem. Write the Advantages and Disadvantages of FEM.

UNIT-II

3. Consider the bar loaded as shown. Determine the nodal displacements assume E= 200 GPa



OR

4. A composite slab consists of 3 materials of different conductivities i.e. 20 W/m ^{0}C, 30 W/m ^{0}C, 50 W/m ^{0}C of thickness 0.3 m, 0.15 m and 0.15 m respectively. The outer surface is 20 ^{0}C and the inner surface is exposed to the convective heat transfer coefficient of 25 W/m^2 ^{0}C at 300 ^{0}C. Determine the temperature distribution within the wall.

UNIT-III

5. For the 3-bar truss shown in fig, $E_1 = 2\times10^5$ MPa, $E_2 = 1.5\times10^5$ MPa, $E_3 = 1.75\times10^5$ MPa, $A_1 = 100$ mm^2, $A_2 = 150$ mm^2, $A_3 = 75$ mm^2. Determine the nodal displacements.

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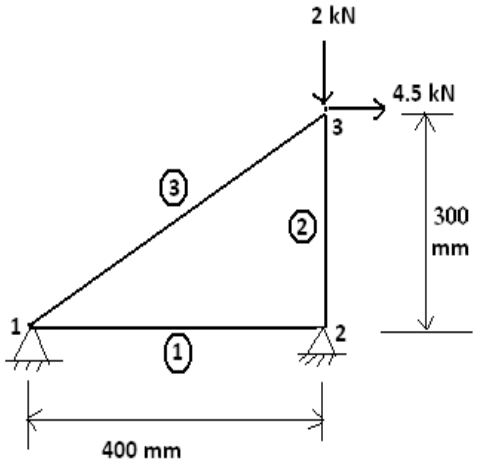
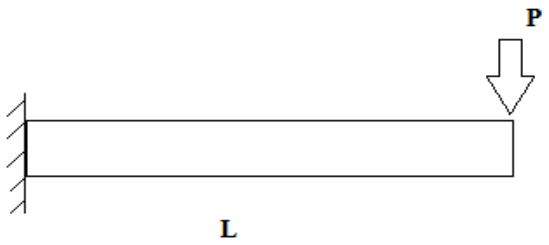


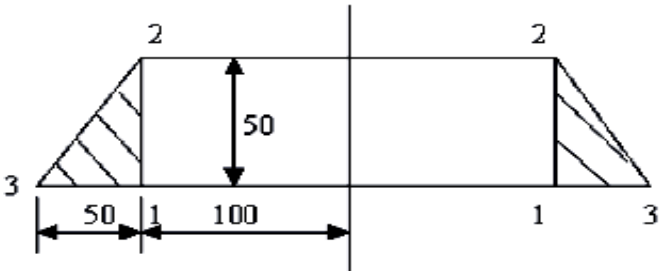
OR

6. Determine the deflection and slope at the end of the cantilever beam subjected to point load at free end. Take Youngs modulus as E and Moment of Inertia as I.



UNIT-IV

7. An axisymmetric ring element is shown in the figure. Derive the matrices [B] and [D]. Take E = 2×10^5 N/mm^2 and $\upsilon = 0.33$.



OR

8. Analyze the following integral equation using two and three point Gaussian Quadrature formula and compare with exact solution. Given for 2×2 rule, $\xi_i = \pm 0.57735$, $w_i = 1.0$

$$I = \int_0^2 \int_0^2 (x^2 + x y^2)\, dx dy$$

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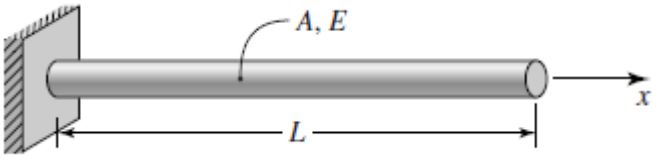
UNIT-V

9. Using two equal-length finite elements, determine the natural circular frequencies of the solid circular shaft fixed at one end shown in figure.



OR

10. a) Derive the mass matrix for one dimensional bar element.
    b) Give the properties of Eigen Values and Eigen Vectors

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