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14MCM151

First Semester M.Tech. Degree Examination, Dec.2014/Jan.2015
Finite Element Method

Time: 3 hrs.   Max. Marks:100

Note: *Answer any FIVE full questions.*

1 a. Write the significant role of choosing the displacement model in finite element methods. **(04 Marks)**

   b. Explain the simplex and multiplex elements. **(04 Marks)**

   c. A simply supported beam is subjected to a uniformly distributed load of 'P_0' N/m for the entire span. Derive an equation for maximum deflection at the centre using trigonometric function by continuum method. **(12 Marks)**

2 a. Compare the primary characteristics of linear and cubic elements. **(05 Marks)**

   b. Derive the shape functions for 1-D bar element in local co-ordinate systems. **(05 Marks)**

   c. Using R-R method find the value of central deflection of a fixed beam that carries a concentrated load 'P' at the center. Assume the trail function as $y = y_0\left[1 - \cos\dfrac{2\pi x}{L}\right]$. **(10 Marks)**

3 a. Determine the displacement at node 2, reactions at supports, stress and strain. Take $E_1 = 70$ GPa, $E_2 = 200$ GPa for element 1 & 2 respectively. **(12 Marks)**

$P_1 = 300$ kN
$P_2 = 800$ kN/m

Fig. Q3 (a)
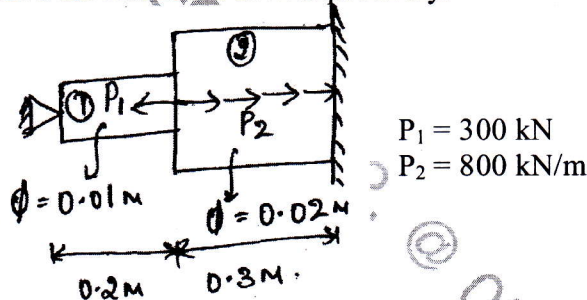
   b. Explain the potential energy formulation for an elastic body. **(08 Marks)**

4   A four bar truss element is as shown in figure. Determine the following:
   i) Nodal displacements
   ii) Stress in each element.
   iii) Reaction at the support.
   Area of each element is 100 mm^2 and E = 2×10^5 N/mm^2 **(20 Marks)**

Fig. Q4
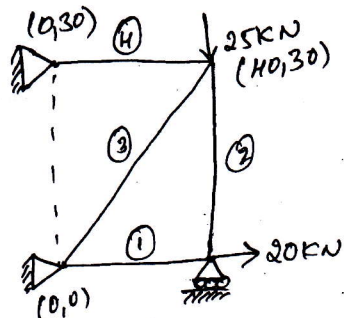
5 a. Explain modern design process. (06 Marks)
 b. Explain functional areas of CAD and CAE. (07 Marks)
 c. List and explain functions of CAD/CAE package or software. (07 Marks)

6 a. Explain rotation and scaling technique of transformations in 3D. (10 Marks)
 b. Explain projection on to a 2D plane in transformations. (10 Marks)

7 a. Explain 3D rotation about arbitrary axis. (10 Marks)
 b. Explain curve fitting and representation by deriving parametric equations for B-spline curve. (10 Marks)

8 a. Give the mathematical representation of Bezier surface. (10 Marks)
 b. Explain generation of cubic Hermit surface. (10 Marks)

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