Hall Ticket Number:

Code No.: 8123 M

VASAVI COLLEGE OF ENGINEERING *(Autonomous)*, HYDERABAD

M.E. I Year (Mech.) I-Semester (Make Up) Examinations, March-2016

(Advanced Design & Manufacturing)

Finite Element Techniques

Time: **3** hours Max. Marks: **70**

*Note: Answer **ALL** questions in **Part-A** and any **FIVE** questions from **Part-B***

Part-A (10 X 2=20 Marks)

1. State stress equilibrium equations and apply it for 1D structural problem.
2. Write the shape functions for a bar element.
3. Explain the significances of Hermit shape functions applied to a beam element.
4. List few applications related to frame elements.
5. Examine the difference between three nodded triangular element and six nodded triangular element.
6. Give few examples geometric isotropy.
7. Explain about torsional rigidity in the context of F.E.M applied to a circular shaft.
8. Develop FEM formulation for a dynamic system described by $[M]\, y''(t) + [K]\, y(t) = 0$.
9. Distinguish between Membrane plate element and Bending plate element.
10. Write about material non linearity.

Part-B (5 X 10=50 Marks)

(All bits carry equal marks)

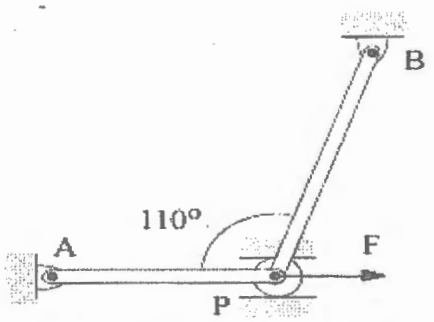
11. The displacement field in a material is given by

    $u_x = A(3x - y), \quad u_y = Axy^2$

    where A is a small constant.

    Evaluate the strains. What is the rotation? Sketch the deformation and any rigid body motions of a differential element at the point (1,1).

12. A force F= 20 kN is applied to the roller that slides inside a slot as shown in Fig. given here under Both bars have an area of cross-section of A = 100 mm^2 and a Modulus of Elasticity E = 200 GPa. Bar AP and BP have lengths of AP= 200 mm and BP= 250 mm respectively. Determine the displacement of the roller and the reaction force on the roller using linear elements to represent each bar.



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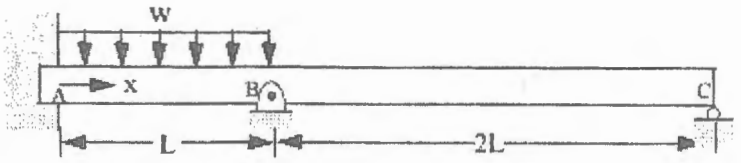
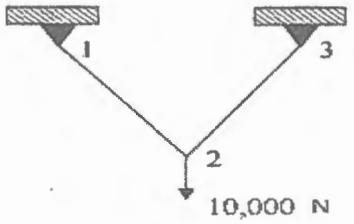
13. Using a single beam element for AB and a single beam element for BC in Fig. given here under, determine (a) the slope at B and C (b) reaction force and moment at A.



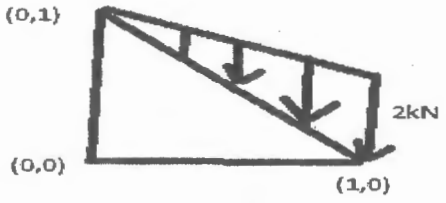
14. A truss structure and its node table shown below: Element area = 1 cm^2 , Material = steel (200GPa)



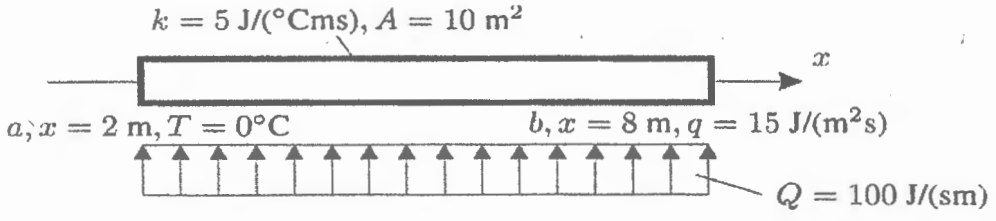
Node	X	Y
1	0	40
2	30	0
3	60	40

A. Find the joint displacements at 2. Find the stress in the elements.

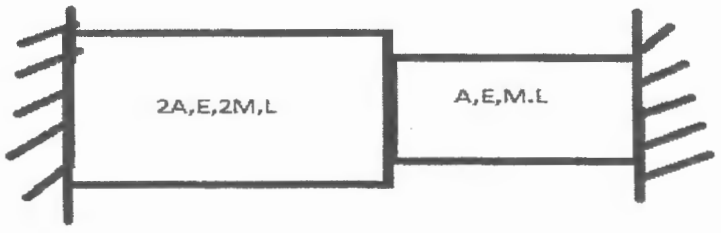
15. CST element shown below has no body force and a surface traction applied to one of the edges. Find load vector for the element.



16. A 1D conduction element is shown below with end points a(x=2) and b(x=8).The end a is maintained at temperature 0°C and end b allowed heat flow 15 W/m^2.Element is given a heat supply Q. Idealize it into two elements and determine nodal temperatures in x-direction.



17. Extract eigen values and eigen vectors for stepped bar shown below:



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