M.Tech. Mechanical Engineering Design (CBCS Pattern) Semester-II

MED22 - Finite Element Analysis

P. Pages : 2 **GUG/W/24/14194**

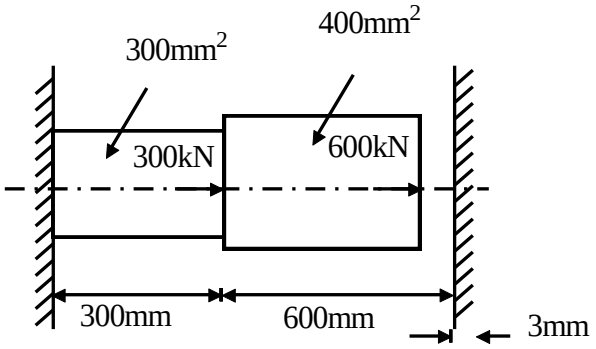
Time : Three Hours * 5 6 9 2 * Max. Marks : 70

Notes : 1. Answer **any five** questions.
2. All questions carry marks as indicated.
3. Due credit will be given to neatness and adequate dimensions.
4. Assume suitable data wherever necessary.
5. Diagrams and Chemical equation should be given wherever necessary.
6. Illustrate your answers wherever necessary with the help of neat sketches.
7. Use of slide rule, Logarithmic tables, Steam tables, Mollier's chart, Drawing instruments, Thermodynamic tables for moist air, Psychrometric charts and Refrigeration charts is permitted. Non Programmable Electronic Calculator is allowed.

1. a) What do you understand by "post processing" in finite element analysis? **7**

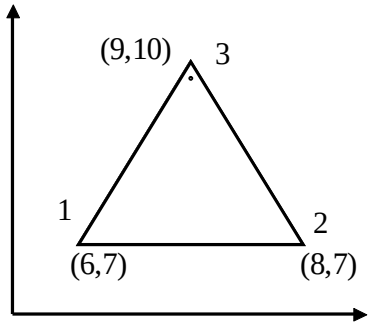
b) Explain in brief the concept of iso-parametric representation used in Finite element method. **7**

2. Consider the two bars shown in Fig. If the deformation of the right end is not to exceed 3 mm, find nodal displacement, element stresses and support reactions. Take E = 200 GPa. **14**

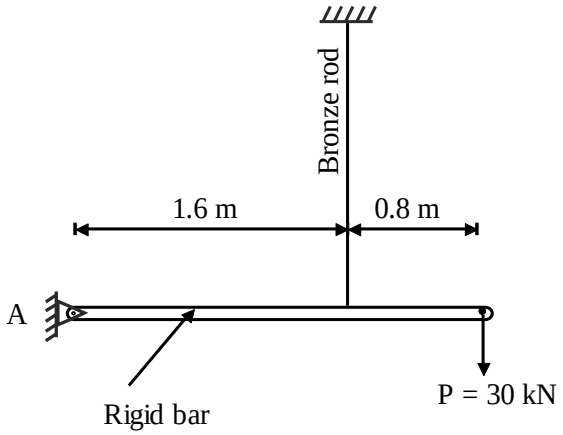


3. Calculate the element stiffness matrix for the axis symmetric triangular element shown in figure. Element experiences a 15°C increase in temperature. The co-ordinate are in mm. **14**

$\alpha = 10*10^{-6}$ / ^{o}C, $E = 2*10^{5}$ N / mm^2, 1 / m = 0.25.

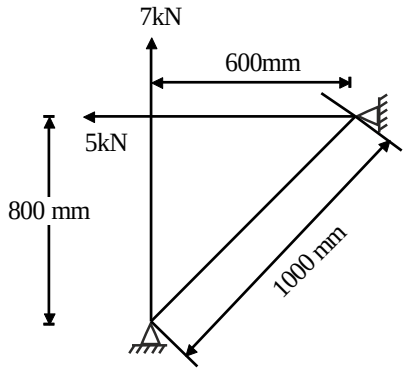


4. A horizontal rigid bar of negligible mass, hinged at A in fig., is supported by a bronze rod 2m long having cross section area 300 mm^2 and E = 83 GPa. Determine displacement at a node at which force of P = 30 kN is applied and Hence find stress in bronze rod. **14**



5. A truss shown in fig. The cross section area of all elements is 450 mm^2 and $E = 2x10^5$ N/mm^2. **14**

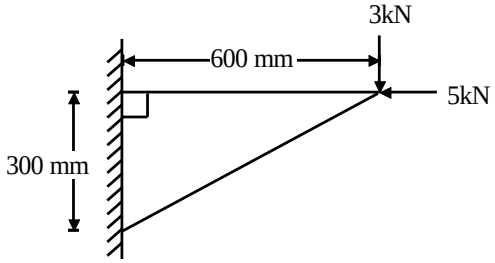
i) Determine element stiffness matrix for each element. ii) Assemble the structural stiffness matrix for entire truss. iii) Find nodal displacement iv) Find stresses in all elements. v) Calculate the reaction force.



6. a) What are modelling techniques? Explain in detail. **7**

b) What are storage techniques, explain in brief. **7**

7. A two dimensional plate shown in figure has thickness of 10 mm and mode of elasticity $E = 2 \times 10^5$ N/mm^2, and Poisson's ratio v = 0.3. Determine nodal displacement using plane stress condition. **14**



8. Derive the transformation matrix for 2 noded beam element with 6 DOF. **14**

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