

BE/Insem./Oct.-517**B.E. (Mechanical Engineering)****Finite Element Analysis (Elective - I)
(2015 Pattern)****Time : 1 Hour]****[Max. Marks : 30****Instructions to the candidates:**

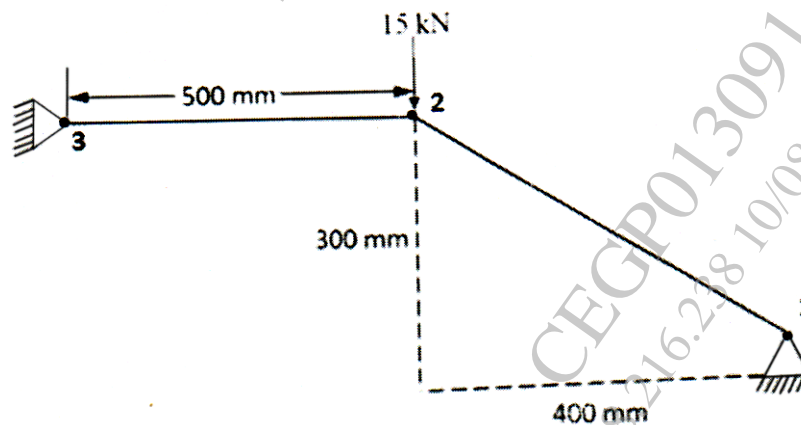
- 1) Draw suitable neat diagrams, wherever necessary.
- 2) Figures to the right indicate full marks.
- 3) Use of electronic pocket calculator is allowed.
- 4) Assume suitable data if required.

- Q1)** a) Explain the terms : i) Linear static analysis, ii) Non-linear analysis [6]
b) State general steps involved in Finite Element Analysis [4]

OR

- Q2)** a) Discuss various engineering applications of Finite Element Method. [4]
b) Explain “Galerkin Weighted Residual Method” to formulate FEM equations [6]

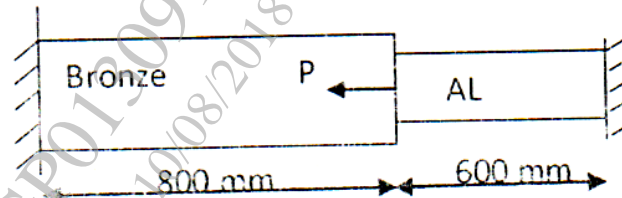
- Q3)** For the two-bar truss shown in figure below, determine the displacement of node 2 and stresses in the element. All the elements have $E = 70 \text{ GPa}$ and $A = 200 \text{ mm}^2$. [10]

**OR****P.T.O.**

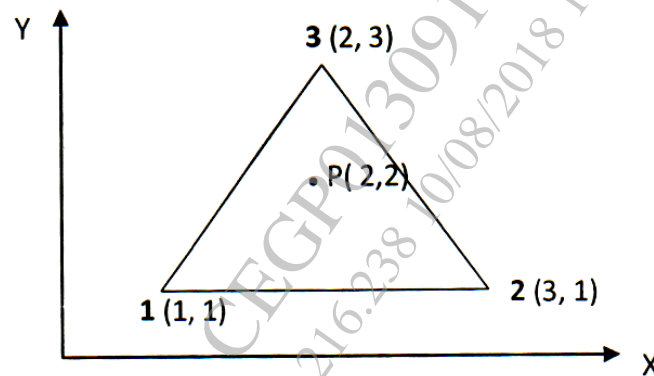
Q4) The structure shown in Figure is subjected to an increase in temperature of 80°C . Determine nodal displacement and element stresses. [10]

Bronze: Area = 2400 mm^2 , $E = 83 \text{ GPa}$, $\alpha = 18.9 \times 10^{-6} \text{ per } ^{\circ}\text{C}$

AL: Area = 1200 mm^2 , $E = 70 \text{ GPa}$, $\alpha = 23 \times 10^{-6} \text{ per } ^{\circ}\text{C}$, $P = 60 \text{ kN}$,



Q5) For the triangular element shown, the nodal values of displacement in x and y directions respectively are $u_1 = 2.0$, $u_2 = 3.0$, $u_3 = 5.0$ and $v_1 = 1.0$, $v_2 = 2.0$, $v_3 = 3.0$. Find out for plane stress conditions (a) Displacement of point P, (b) Strain-displacement relationship (c) Element stress (d) strains [10]



OR

Q6) a) How Pascal triangle is used to determine a shape function for 2D elements? Explain with example. Why displacement function should be symmetric about the axis of Pascal triangle? [6]

b) What are the characteristics of shape function? [4]

