M.Tech. Structural Engineering & Construction (Old (CBS) and C.B.C.S. Pattern) Sem-II

PSES21 - Finite Element Method

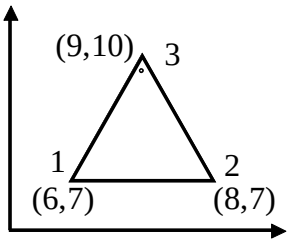
P. Pages : 2 **GUG/S/19/11013**

Time : Four Hours * 2 9 7 5 * Max. Marks : 70

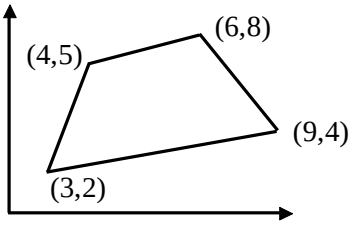
Notes : 1. All questions carry equal marks.
2. Due credit will be given to neatness and adequate dimensions.
3. Assume suitable data wherever necessary.
4. Illustrate your answers wherever necessary with the help of neat sketches.
5. Solve **any five** only.

1. Derive the shape function for 4 noded rectangular element by using natural co-ordinate system. **14**

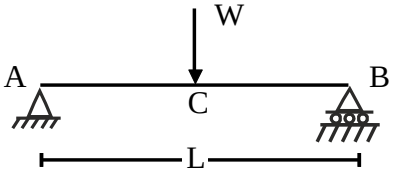
2. Calculate the element stiffness matrix for the axis symmetric triangular element shown in figure. Element experiences a 15ºC increase in temperature. The co-ordinate are in mm **14**
$\alpha = 10 \times 10^{-6} / ^{o}C \quad E = 2 \times 10^{5} N / mm^{2} \quad {}^{1}/_{m} = 0.25.$



3. Evaluate the Cartesian co-ordinate of the point P which has local co-ordinate $\varepsilon = 0.6$ $h = 0.8$. **14**



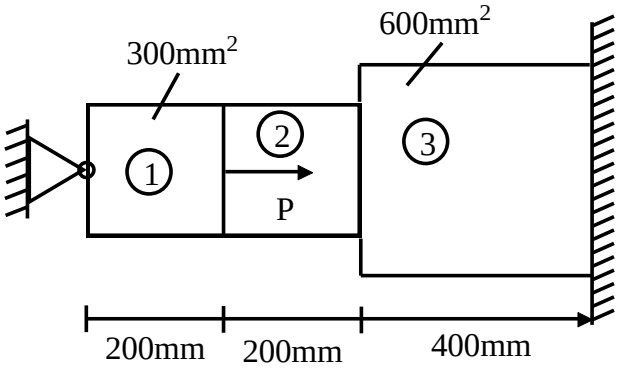
4. A beam AB of span L simply supported at end and carrying a concentrated load W at the centre 'C' as shown in figure. Determine deflection at midspan by using Rayleigh-Ritz method and compare exact solution. **14**



OR

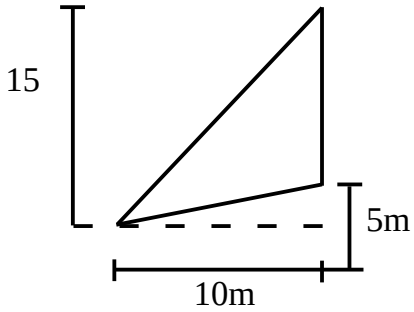
5. Write a note on **any two**. **14**
1) Modelling Technique.
2) Storage Technique.
3) Solution Technique.

6. For the element as shown in figure calculate the nodal displacement and elemental stress. **14**



OR

7. For the triangular element as shown in figure determine displacement matrix [B] and constitutive matrix [D] assume plane stress condition Take $\mu = 0.3$ $E = 30 \times 10^6 \, N/m^2$ and thickness t = 0.1. Also calculate the element matrix for triangular element. **14**



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