M.Tech. Regular-Semester 2012-CAD/CAM Sem II

MTCC-1003 - Finite Element Method

P. Pages : 3 **GUG/W/16/3935**

Time : Three Hours * 4 7 6 4 * Max. Marks : 70

Notes : 1. All questions carry equal marks.
2. Answer **any five** questions.
3. Due credit will be given to neatness and adequate dimensions.
4. Assume suitable data wherever necessary.
5. Illustrate your answers wherever necessary with the help of neat sketches.
6. Use of non-programmable calculator is permitted.

1. a) Describe the stress components in 3-D stress situation by considering a cubical element. Denote the stresses on all the six faces of this cubical element. **8**

b) Explain the significance of plane stress and plane strain conditions in stress analysis problems. **6**

2. a) Determine the displacement at point A in the bar as shown in fig. 1 using Rayleigh Ritz approach. **10**

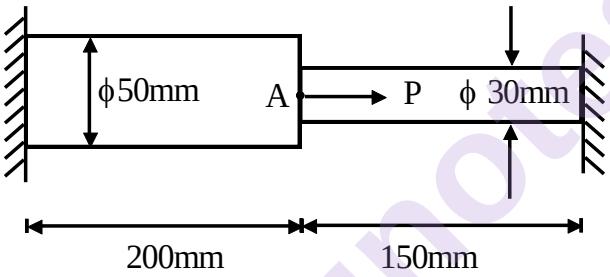
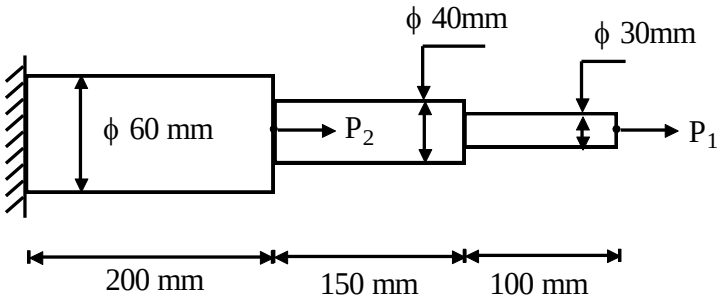


Fig.1

$E = 200 \times 10^3$ N/mm^2 P = 2 kN

b) Explain the effect of support and constraints on stress distribution near the supports. **4**

3. A bar as shown in fig. 2 is subjected to loads. Determine stresses and reactions. **14**



$P_1 = 4$ kN $P_2 = 3$kN

$E = 200 \times 10^3$ N/mm^2

Fig.2

4. Determine the stresses and reaction for the truss as shown in fig. 3. **14**

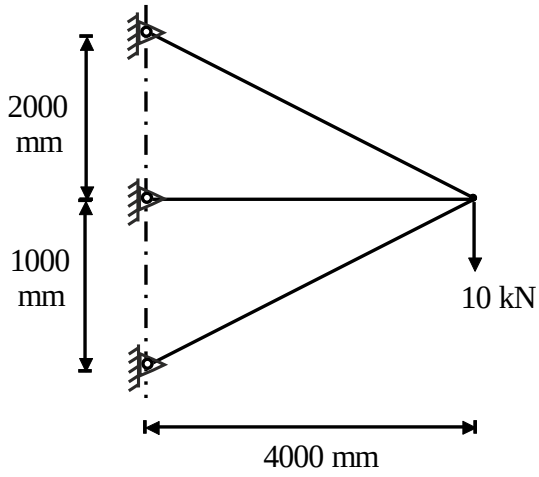


Fig.3

$E = 20 \times 10^3 \text{ N/mm}^2$

$A = 300 \text{ mm}^2$

5. Determine the stresses in a plate using CST elements as shown in fig. 4. **14**

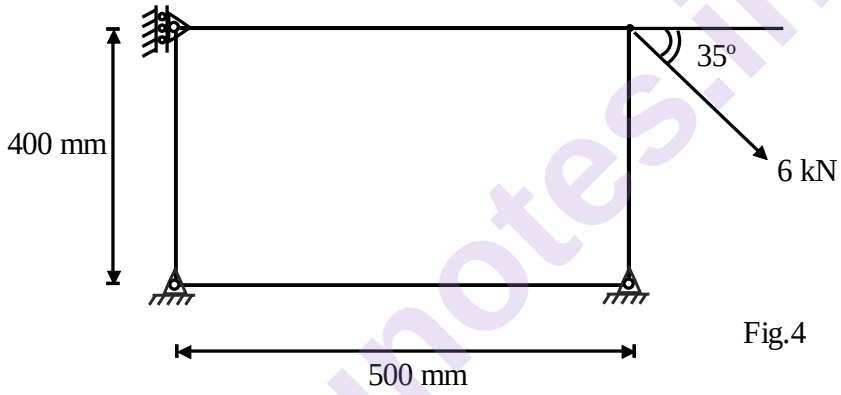


Fig.4

$E = 200 \times 10^3 \text{ N/mm}^2$
Thickness of plate (t) = 5mm
$\mu = 0.3$

6. a) Determine the shape functions N_1, N_2 and N_3 at the interior point P(3.7, 4.5) for the triangular element as shown in fig. 5. **5**

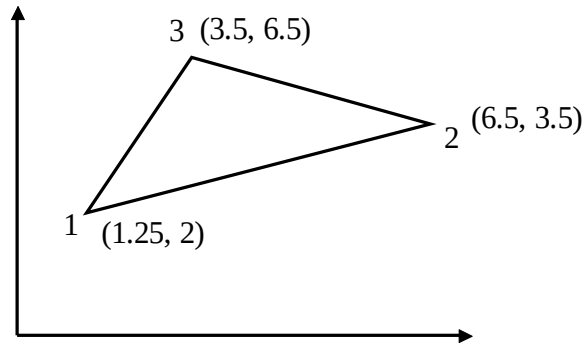
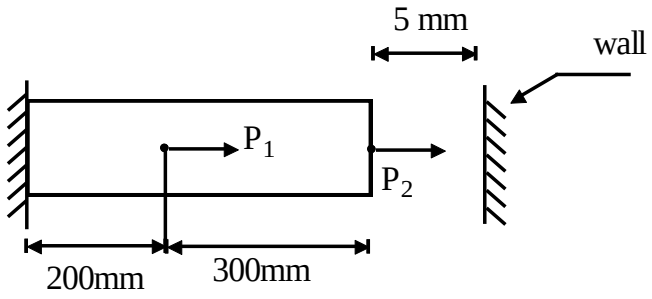


Fig.5

b) Explain the advantages of LST over CST. **4**

c) What do you mean by Isoparametric elements ? Explain. **5**

7. Determine the displacement, stress and support reactions for the bar as shown in fig. 6. **14**



P_1 = 30 kN $E = 200 \times 10^3$ N/mm^2

P_2 = 25 kN A = 250 mm^2

Fig.6

8. Write short notes on **any two** of the following. **14**

i) Pre and Post processing in FE analysis.

ii) Axisymmetric analysis.

iii) Various parameters to be considered during meshing.

****